



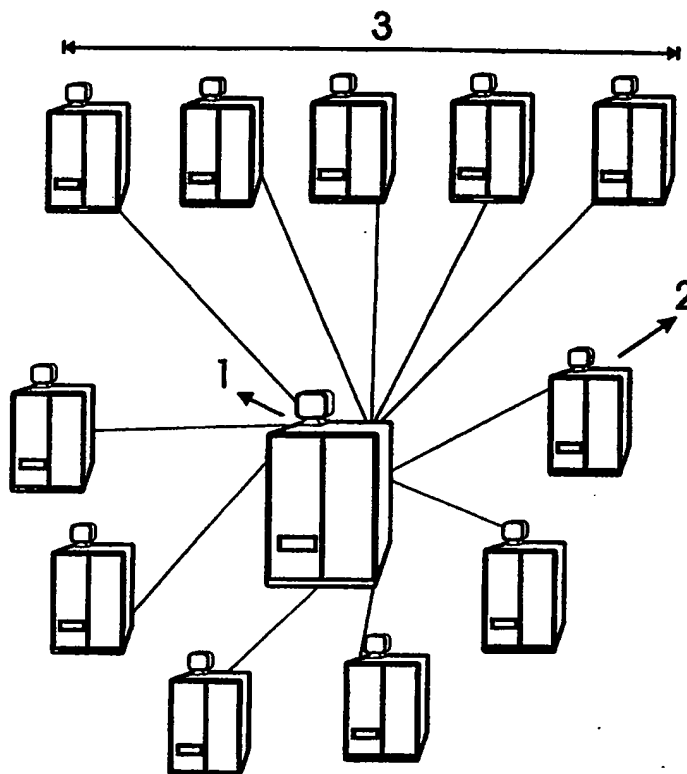
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: ELECTRONIC BOOKSTORE VENDING MACHINE

## (57) Abstract

The present invention provides a method and system for producing books on-demand. An electronic bookstore in accordance with the subject invention can receive an electronic text file of a book and then print and bind a copy of the book. A user may browse an electronic catalog, for example over the Internet, and place an order for a book which can be picked up at a conveniently located electronic bookstore (2) shortly after placing the order. The subject invention reduces costs and waste associated with conventional production and distribution of print matter. Advantageously, the subject invention allows books with smaller audiences to be published at a reasonable price. An electronic bookstore (2) in accordance with the subject invention can have access to literally millions of books and can print and bind any selected book in a few minutes.





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DESCRIPTIONELECTRONIC BOOKSTORE VENDING MACHINE

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Background of the Invention

Books were among the firsts articles to be mass produced. The Gutenberg printing press was replaced by the lithography process, and then by offset printing. The goal of these processes and machines was to produce larger runs of, for example, books, magazines, and newspapers. The idea of large runs was central to the way the market developed in the western world: it was imperative to produce large quantities of a single item, so it could be created cheaply enough so as to be distributed all over the world and then sold locally. Mass production was the only way of achieving the goals of low cost, and accessibility through general distribution.

Recent discoveries, however, give us now the possibility of achieving the goals of lower cost and accessibility through a new process which does not involve mass production. Due to the advances in electronic processing of texts, a person can have access to books, magazines, and newspapers, written and edited at a distant location, distributed not by means of paper, but electronically. This newfound capability has prompted many people to suggest that we can do away with paper altogether, and handle all our texts electronically. This has lead to the development of many forms of electronic text processors. However, with respect to books, it is not practical because very few people like to read, for example a 600 page book, on a computer screen. For example, millions of people recently bought paper printed copies of such a book, namely, Sophie's World.

A method of distributing and manufacturing music on cassette tapes is disclosed in US Patent 4,528,643 Freeny Jr. Although Freeny Jr. discloses the method for distribution and reproduction of music at a remote location, it does not disclose the apparatus needed to distribute and reproduce books. In addition, Freeny Jr. does not disclose transmitting the music to a remote location in real time in response to a customer's order. In contrast, the Freeny Jr. disclosure requires an information manufacturing machine to electronically store all of the songs a consumer may select at the point of sale location. Accordingly, the selection is limited by the storage capacity of each information manufacturing unit.

The traditional method of producing and distributing books is wasteful. The traditional system requires the publishing industry to print millions of books, newspapers and/ or magazines and then, after the books are produced, seek to sell them. Consequently, very large numbers of those books, newspaper, and magazines go to waste when they are not sold. This waste affects



the price of the finished product and, therefore, the consumer must pay for this waste. In addition, the environment is being damaged by this activity.

Typical book binding machines are constructed to satisfy the needs of the publishing industry to produce larger and faster runs. The typical large capacity automatic book-binding systems are very expensive since several machines are required to print and bind a book, for example, an offset (or lithograph) printer, a transportation device for the paper, a paper sheet lifter, a web or collating machine, a folding machine and a thermal binder. To print a book, a very old technique called signature is often used, in which many pages (front and back) of a book are distributed on a large sheet of paper. Each signature holds many pages of the book, half of them head up and half of them head down so that when the large sheet of paper is folded the book pages match. After printing all of the signatures, the signatures are moved along a web, folded, glued and/or sewn. The book receives the cover and it is finally cut on three sides by a paper cutter.

These traditional systems work fine with the large runs of books, however, these systems do not work well with short runs of books which may be sporadic. US Patent No. 5,465,213 discloses an method to make single copies of books. However, the method disclosed in U.S. Patent No. 5,465,213 requires an enormous capacity of digital storage due to the fact that their method uses a raster image (a copy) of the pages of a book. This raster image is acquired by copying a book which has already been printed, for example in the traditional way. As is well known, a raster image (bit-map) is akin to a photograph. These images are then stored in high-capacity optical disks, and the enormous size of an electronic file of the rasterized (scanned) book allows their system to store only a few dozen books per optical disk. Although U.S. Patent No. 5,465,213 mentions the distribution of update information, for example for the index, through a modem, such large electronic files would also require large amounts of transmission bandwidth and time and, therefore, would require a great deal of time to be printed. U.S. Patent No. 5,465,213 does not disclose the transmission of the raster images from a remote location in real time, for example in response to a customer's order. Furthermore, the method disclosed by U.S. Patent 5,465,213 only allows searches of the index and/or description of the book. This is a severe limitation since the contents of the books cannot be searched. The main drawback of the disclosure of U.S. Patent 5,465,213, however, is that a physical description of a unique apparatus for the binding and the delivery of the books is not disclosed. It discloses the use of commercially available binding machines which may or not work with the proposed system. In addition, the disclosed binding method uses thermal binding, which can release fumes that can be harmful to living beings. Accordingly, addressing the fumes released during thermal



binding can be expensive. Most importantly, the disclosure of U.S. Patent No. 5,465,213 concerns the reproduction of books which have already been printed and, therefore, does not avoid the necessity of an original printing of the books by the traditional methods.

U.S. Patent 5,547,176, provides for an apparatus to copy (scan) a book and print the scanned images onto loose pages, and a method to bind those loose pages together by means of folding the sheets into semi-signatures and holding them together with a metal clasp. The disclosure of U.S. Patent No. 5,547,176 requires the scanning of pages of a book already printed and creates images stored in inflexible bitmapped graphics. In addition, the binding process requires a metal clasp to hold the signatures together, making it uneconomical.

#### Brief Summary of the Invention

The present invention provides a method and system for producing books on-demand; it can reduce the costs and improves the way books, magazines and other printer matters are created and delivered to the customer, helping to preserve both the environment and human health. The subject invention pertains to an electronic bookstore (EBS) vending machine which can receive an electronic text file of the contents for a book and then print and bind a copy of such a book. The electronic text file can be requested by communication with a central distribution unit (CDU) which can have the electronic text files stored and/or can access the electronic text files at, for example, a plurality of publisher's and/or author's storage facilities. The CDU, upon receiving a request for a certain book, can access and transmit the electronic text file to an appropriate EBS. Alternatively, the EBS can receive the electronic text file by any other available means, for example, floppy disks, optical disks, magnetic storage devices, via a modem, or from another computer. Once the EBS receives the electronic text file, the book can be printed and bound at the EBS.

The subject electronic bookstore vending machine pertains to a method, apparatus, and system, which when assembled together, allow the local printing, binding, and selling of a book, magazine, newspaper, or other printed matter in just a matter of minutes, and for a fraction of what it costs using traditional means. Using this system, each Electronic Bookstore can have access to millions of titles all of the time, day or night, without ever running out of them or having titles out of print. The method described in the present invention is flexible; it can allow complete searches of a book's contents and allow the reformatting of the size and type of fonts to accommodate the needs of visually challenged people. For example, the present method can allow for large type formatting and printing on demand.



The present invention ameliorates the problem of waste by allowing the delivery of printed matter on-demand, any time, any place, therefore, reducing the waste inherited in excessively large runs of books and magazines.

Another benefit of the present invention is to allow many more authors to publish their books in an economical fashion. Today, the publishing industry is affected by the ever rising costs of printing ever larger runs, therefore making it almost impossible for non-commercial writers to publish their works. Vast amounts of knowledge are lost when authors are not capable of publishing their books due to a small predicted audience or market. Certain types of books are more difficult to sell. Therefore, authors in subjects such as poetry, philosophy, science, and theater can find it difficult to publish their work due to the high investment required to print the books in the conventional manner.

The present invention can utilize the Internet as a way of distribution, in order to provide on-demand delivery. Writers can become their own publisher, for example, if their works are rejected through the convention publishing channels. Authors can make their works available to a wider audience. The present invention can also reduce the overall costs of producing books. Accordingly, the subject invention can increase the accessibility of knowledge, both in time and in price.

#### Brief Description of the Drawings

**Figure 1** illustrates the interaction of a central distribution unit, a plurality of electronic bookstores, and a plurality of electronic text storage devices, in accordance with the subject invention.

**Figures 2A and 2B** illustrate an electronic bookstore, in accordance with the subject invention.

**Figure 3** illustrates a specific example, in accordance with the subject invention where an EBS communicates with a CDU to request data corresponding to selected books and the CDU communicates with publisher's computers to have the requested data sent directly from the publisher's computers to the EBS for printing and binding.

**Figure 4** illustrates the interaction of a storage and decoder means, a user interaction means, a distribution means, and a printing means of an EBS in accordance with the subject invention.

**Figures 5A - 5E** illustrate the interaction of a printing means, a paper transporting means, and a cutting means of an EBS in accordance with the subject invention.



Figures 6A - 6C illustrate a cutting means with a specific notching pattern, in accordance with the subject invention.

Figures 7A and 7B illustrate a paper-tray station for holding the book pages after printing and cutting, in accordance with the subject invention.

5        Figures 8A and 8B illustrate a movable clamping means which can hold the book pages as a book block, in accordance with the subject invention.

Figures 9A and 9B illustrate the jaws of a clamping means in accordance with the subject invention.

Figure 10 illustrates a stacking means in accordance with the subject invention.

10        Figure 11A and 11B illustrates a book block moving down a line from where it is formed into a book block to where glue is applied, in accordance with the subject invention.

Figures 12A and 12B illustrate a glueing means in accordance with the subject invention.

Figure 13 illustrates a drying means in accordance with the subject invention.

15        Figure 14 illustrates a labeling means in accordance with the subject invention.

Figures 15A - 15C illustrate a folding means for folding the spine cover strip label up onto both sides of a book spine, in accordance with the subject invention.

Figure 16 illustrates a final forming means in accordance with the subject invention.

Figure 17 illustrates a book exiting an EBS in accordance with the subject invention.

20        Figure 18 illustrates book page distribution in the sequence 4 in 1, in accordance with the subject invention.

Figure 19 illustrates book page distribution in the sequence 8 in 1, in accordance with the subject invention.

25                                    Detailed Disclosure of the Invention

The present invention provides a method and system for producing books on-demand; it can reduce the costs and improves the way books, magazines and other printer matters are created and delivered to the customer, helping to preserve both the environment and human health.

30        The subject invention pertains to a method and a system designed to automatically print and bind books, magazines, and other printed matter. The present invention is a step by step method and a system which are unique and an improvement over existing techniques, for formatting, printing, and binding, for example, a book, a magazine, or other printed material.



The present invention pertains to a series of methods, apparatus and systems which, when assembled together, allow the local printing, binding, and selling of a book, magazine, newspaper, or other printed matter in just a matter of minutes, and for a fraction of what it costs using conventional means. Using the subject invention, each electronic bookstore can have  
5 access to millions of titles all of the time, day or night, without ever running out of them or having titles out of print. Each electronic bookstore can provide access to the electronic texts of many books at a lower cost, thus eliminating much of the waste which prevails in the present system. The method described in the present invention is flexible; it can allow complete searches of the contents of the texts and can allow the reformatting of the size and type of fonts  
10 to accommodate, for example, the needs of visually challenged people. The present method allows for large type formatting and printing on demand.

The present invention ameliorates the problem of waste by allowing the delivery of printed matter on-demand, any time, any place, therefore reducing the waste inherited in excessively large runs of books and magazines. Examples of situations where the subject EBS's  
15 can save costs and reduce waste include school systems, libraries, bookstores and corporations which need to print and bind, for example, employee manuals on-demand. Specifically, a school could utilize an EBS to print textbooks for students, wherein the text files can be accessed directly from the publishers and only the number of textbooks actually needed can be printed. Accordingly, the publishers do not print extra textbooks that go to waste and schools do not have  
20 to purchase extras, just in case, that go to waste.

Another benefit of the present invention, is to allow many more authors to publish their books in an economical fashion. Today, the publishing industry is affected by the ever rising costs of printing ever larger runs, therefore making it almost impossible for non-commercial writers to publish their works. Vast amounts of knowledge are lost when authors are not capable  
25 of publishing their books due to a small predicted audience or market. Certain types of books are more difficult to sell. Therefore, authors in subjects such as poetry, philosophy, science, and theater can find it difficult to publish their work due to the high investment required to print the books in the conventional manner.

Advantageously, the present invention can utilize, for example, the Internet as a means  
30 of distribution in order to provide on-demand delivery. Writers can become their own publisher if their works are rejected through the conventional publishing channels. Accordingly, authors can make their works available to a wider audience. The present invention can also reduce the overall costs of producing books. The subject invention can increase the accessibility of knowledge, both in time and in price.



In a specific embodiment of the present invention, referring to Figure 1, at least one central distribution unit (CDU) 1 is connected, for example through a modem and through a telephone line, a satellite link, cable feed, wireless system, or some other communication channel, to a plurality of remote electronic bookstores (EBSs) 2 having the same or similar means of intercommunication. The CDU 1 is a device capable of retrieving and distributing large amounts of information stored in the form of electronic bits (electronic text) in, for example, a plurality of computers 3 of different publishers and authors. Image files can also be accessed, for example for graphs, photos, and drawings. The EBS 2 is an apparatus which has the means to receive electronic data sent by the CDU 1, hold it temporarily while the electronic bits are transformed and formatted into book pages and covers, and then send the information to a high-speed printing means. This method of distributing the information to the remote units does not require the EBS to have a large storage capability and, therefore it is extremely economical to operate.

In a preferred embodiment of the present invention, referring to Figures 2A and 2B, the EBS 2, can include the following:

- a receiving means 4 to receive data electronically, for example via telephone line, satellite, cable, wireless feed or other type of device to receive electronic data;
- a storage and decoding means 5 for storing and decoding the received data,
- a user interaction means 6 to allow a user to preview the received data and/or provide input to the EBS;
- a distribution means 7 for distributing the data to a printing means 8;
- a printing means 8 for printing the data on, for example, a plurality of loose sheets of paper;
- a transport means 9 to transport the loose sheets of paper;
- a paper cutting means 10 to cut the sheets of paper and, preferably, to notch the 'spine' edge of the book pages to prepare them to receive the glue which will bind them together in a book form,
- a holding means 11 to hold the loose sheets of paper;
- a clamping means 12 to clamp the loose sheets of paper into a book block and transport said book block through the rest of the process;
- a stacking means 13 to stack, vibrate and align the lose sheets of paper into a single book block,
- a glueing means 14 to apply cold glue to the spine of the book;
- a cleaning means 15 to clean and collect excess glue;



a drying means 16 to dry the glue with, for example, hot air and a timer;  
a labeling means 17 to attach heavy-stock strip labels to the spine of the book;  
a folding means 18 to fold the strip labels around the spine of the book;  
a trimming means 19 to trim any excess of strip label or paper;  
5 a forming means 20 to give the final form to the book;  
a delivery means 21 from which the book will exit the EBS;  
a money collecting means 22 to collect money from a customer; and  
a storage space 23 to store paper and other materials.

10 In accordance with the subject invention, a customer can browse through an electronic catalog of books on, for example, his computer at home via the Internet, or at a site where a EBS 2 is located, for example through user interaction means 6. User interaction means 6 can be, for example, a touch screen display, a keyboard, a voice recognition system, or any other system to allow a user to provide input and/or preview the information pertaining to available books  
15 and/or preview the received data. The electronic catalog can be, for example, a searchable database located at the CDU 1, the EBS 2, publishers storage facilities 3, or a separate location. In a preferred embodiment, a customer can search the contents of one or more books stored in a plurality of publishers computers 3 to find the books that are suited to the customers needs. Once the book(s) is chosen, a customer can then request the book(s) be printed and bound at a  
20 conveniently located remote electronic bookstore 2.

In a specific embodiment, referring to Figure 3, when a customer requests a book be produced at a EBS 2, the device which receives the request information can electronically send, for example, an encoded signal, to a CDU 1. The CDU 1 can decode the signal and, upon approval of the code, can send the order to the appropriate publisher whose computer 3 holds  
25 the book in, for example, electronic text (bits) file. Another code can be utilized in the communication from the CDU 1 to the publisher to enhance security. The computer of the selected publisher can then release the electronic text (bits) file directly to the appropriate EBS 2, or release the text file to the CDU 1 which can redirect the text file to the appropriate EBS 2. In a specific embodiment, the CDU 1 registers the sale of a single unit of the book and sends  
30 signals to the author, the publisher, and/or the EBS indicating said sale for accounting purposes.

In another specific embodiment, the EBS 2 can communicate directly with a publishers computer storage device such that the publisher's computer storage device can send the text data for the book and control data corresponding to how many copies of the book can be printed.



Referring to Figure 4, the EBS 2 can receive the electronic text (bits) file of the book in electronic data, and the storage and decoder means 5 can transform said data into information for the user interaction means 6 and the software control and distribution means 7. Some of this information, for example, paper size, font size, and type, which is of great importance for visually challenged people, may be altered by the customer by issuing instructions through the user interaction means 6 according to his/her needs and or desires. The information is preferably held in a temporary type memory able to hold, in a transient manner, all of the electronic data pertaining to the content of the book(s) and any formatting information. Once the temporary type memory, for example a hard drive, inside the remote electronic bookstore 2 receives the electronic text, or while it is still receiving, through remote printing commands it can send electronic signals representing the text to be printed to a printing means 8, for example, a laser printer. Printing means 8 can allow for color-printing if desired. The printing means is preferably located within the REB housing.

In a specific embodiment, when all the data is received, the EBS user interaction means 6 can allow the customer to chose, for example, the size and type of fonts to be used in the text and the physical size of the book to be produced. This choice of fonts is particularly beneficial for visually challenged readers.

Each book may be produced in a plurality of sizes. In a specific embodiment, four sizes are available, the sizes derived from cutting a commercially sheet of paper measuring 8"x11" (letter size) in two or in four parts, and the sizes derived from cutting a sheet of paper measuring 8"x14" (legal size) in two or in four parts. These four size are 5.5" x 8", 4.0" x 5.5", 7"x 8", and 4" x 7". These page sizes allow the use of inexpensive, easily attainable paper. The paper to be used may be a special or commercial grade, of varying quality and weight. In general, the subject invention can accommodate a variety of paper sizes. For example, the subject invention can utilize paper already sized correctly, eliminating the necessity of cutting the paper. When pre-cut paper is used the paper can also be pre-notched, to enhance acceptance of the glue used to bind the pages together. Accordingly, when pre-cut paper is utilized in accordance with the subject invention, a cutting means is not necessary to cut the sheets into book pages.

Once the size of the book is determined, for example by customer choice, special software distributes and formats the text into pages as follows:

For the sheets that will not be cut, a book page can be printed on each side of the sheet.

For the sheets of paper that will be cut in two parts, the scaling and distribution of the pages receives a distribution of 4 by 1 (four pages of the book onto one sheet of paper): that is, two pages on the front of the sheet of paper, and two pages in the back.



For the sheets of paper that will be cut in four parts, the scaling and distribution of the pages receives a distribution of 8 by 1 (eight pages of the book onto one sheet of paper): that is, four pages on the front of the sheet of paper, and four pages on the back.

Figure 18 corresponds in shape and form to the distribution of the pages in the sequence 4 in 1. Figure 19 corresponds in shape and form to the distribution of the pages in the sequence 8 in 1

In a preferred embodiment, the software can distribute the pages according to the following examples:

#### 10 Example 1 – Sequence 4 in 1:

This is the case where 2 pages of the book are printed on the front of the sheet of paper, and the matching 2 pages on the back. The following distribution applies to a plurality of 'n' book pages. This sequence should always work regardless of the number of pages in the book.

15 a.- The process begins by dividing the total number of pages in the book by 4. The result will be the total amount of sheets of paper needed to print the book. If the resulting number is a fraction, the software can automatically round up the nearest whole number.

20 b.- In a specific embodiment, the first page of the book can be printed on the front right side 25 of the first sheet of paper, and the last page of the book can be printed on the front left side 26 of the sheet. The second page of the book can be printed on the back of the front right side 25 of the first sheet of paper, while the second to last page can be printed on the back of the front left of the sheet 26. The third page can be printed on the front right side 25 of the second sheet of paper with the fourth page on the back of the front right side 25 of the second sheet. Accordingly the third to last page can be printed on the front left side 26 of the second sheet with the fourth to last page on the back of the front left side 26 of the second sheet. This continues  
25 until all 'n' pages, that composes the book, plus any blank pages added in to achieve an even multiple of four are printed. The blank pages added to round up to a multiple of four can be added at, for example, the front or back of the book. For example, if a book has 97 pages there can be three blank pages added at the end of the book, resulting in the front left side 26 of the first two sheets and the back of the front left side of the first sheet being left blank.

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#### Example 2 – Sequence 8 by 1:

This is the case where 4 pages of the book to be printed are printed on the front of the sheet of paper, and the matching 4 pages are printed in the back. The following distribution



applies to a plurality of 'n' number of pages. This sequence should always work regardless of the numbers of pages in the book.

5 a.- The process begins by dividing the total number of pages in the book by 8. The result will be the amount of sheets of paper needed to print the book. If the resulting number is a fraction, the software automatically can add blank pages to round up to the nearest whole number.

10 b.- In a specific embodiment, the first page can be printed on the top half of the front right side 27 of the first sheet of paper and the last page can be printed on the top half of the front left side 28, with their corresponding matching pages on the back of the same sheet. The third page of the book can be printed on the top half of the front right side of the second sheet of paper and the third to last page can be printed on the left side of the top half of the second sheet, with their corresponding matching pages printed on the back. This continues until all of the sheets of paper are used on the top half. The software then automatically continues with the process at the bottom half part of the sheets of paper 29 and 30 until the entire amount of the 'n' pages that comprise the book are printed. In this example, if the number of pages is not a multiple of eight, blank pages can be inserted in a manner analogous to the previous example 1.

20 In both of the above examples, it is preferred to print the cover first. The cover can also be printed while the book block is being glued. The cover can be printed on a heavier stock paper which can be located in an additional paper bin. A separate printer can be used to print the cover, for example if color images are desired or special stock paper is to be used for the cover. The cover can be printed, for example, on heavier stock paper, leather, or leather like material. The cover stock can be located in an additional bin of the printer.

25 Referring to Figure 4, the distribution means 7 distributes the information to the printing means 8 regarding the size of each sheet of paper, number of pages to print onto each sheet of paper, ways of distributing said pages into the sheets of paper, numbering of said pages, order in which they are to be printed, type and size of fonts to be used, design of the printed matter, graphics to be included, etc. Some of this information, for example paper size, font size, and type, may be changed by the customer according to the customer's needs. Upon receiving the information, the printing means 8 preferably prints on both sides of each sheet of paper at the same time, in the manner requested by the customer through the user interaction means 6 and the distribution means 7. When four or eight pages are printed onto each sheet, the speed of printing the book can be increased. In a specific embodiment, a plurality of printers can be utilized to further speed up the printing of a book. The pages can be printed on commercially

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available bond paper, while the covers can preferably be printed from, for example, a second tray in the printer, to allow the covers to be printed on a heavier stock. The cover can be printed from a second printer which can, for example, allow the covers to be printed on heavier stock. The heavier stock used for the covers can also be commercially available.

5           In a preferred embodiment of the present invention, the system is designed to allow only one copy of each ordered book to be printed. Specifically, when the printing means 8 finishes printing the data, the distribution means 7 can erase the text data from the memory of the REB 2. In a preferred embodiment, the system is designed such that each EBS will only print a designated number of printings of each book, the text of which is transmitted from a CDU 1 or  
10           publisher's computer. A code, for example an encrypted code, can be used to tell if the EBS has been tampered with. This method improves the way the information is handled because it insures that each printed unit of the book will be reported back to the author and/or publisher, who then will be able to collect royalties from the vendor. Accordingly, the owner of the book receives payment for each individual unit of the book sold and is less likely to have the book  
15           pirated.

          Referring to Figures 5A - 5E, as the first sheet of paper exits the printing means 8, it can pass through a sensor, for example, an electronic sensor, that triggers the paper transporting means 9. The paper transporting means can serve at least two purposes. First, it can direct the paper in a certain path and center the sheets of paper. In addition, the paper transporting means  
20           9 can move each sheet of paper into the proper position for the paper cutting means 10. The paper cutting means can cut the paper into the requested size for the pages that form the book. Preferably, the paper transporting means 9 can hold the paper while the paper cutter slices the sheets, and then the paper transporting means 9 can deposit those smaller sheets of paper onto, for example, a paper tray. In a preferred embodiment, the paper sheets are cut one at a time after  
25           exiting the printing means. In an alternative embodiment, a plurality of sheets can be cut at a time.

          Referring to Figures 6A - 6C, the paper cutting means 10 can cut the edges of the paper in a pattern that, for example, can be composed of a vertical cut 31 and a series of horizontal cuts 32 which, for example, can create notches. Other notch patterns can also be implemented, for  
30           example, a zig-zag pattern which allow triangular notches or an interlocking notch pattern. In a preferred embodiment, the sheets are cut and notched at the same time, for example with a single circular cutting instrument which comprises a cutting surface which implements the desired notch pattern. This way of cutting the individual sheets of paper exposes the fibers of the paper and allow for a stronger binding of the pages once the glue is applied. The edge



pattern can create filaments that cross the spine of the book and, once dried, serve the same purpose as traditional book sewing.

5 The cuts in the paper are produced along the inside edge of the pages, namely the side that will be the spine of the book. This is done so the sheets of paper will be cut down to the proper size and shape for the pages that form the book block. The shape of the cut in the paper will insure that once the paper is gathered into a book format, the spine of the paper will expose enough fibers to allow the proper gluing of the spine and, therefore, achieve a stronger bond between the pages themselves and the spine cover of the book. This is an improvement over the traditional methods of roughening the spine after the book block is formed. It saves time of  
10 production, improves quality of results, and improves the process by allowing even the thinnest of books (a few dozens of pages) to be bound together in a long-lasting manner.

It is preferred that the depth of the notches be in the range of about 0.5 mm to about 1.5 mm, in order to allow for sufficient binding strength of the glue without creating difficulty in aligning the book pages with each other to form a book block. More preferably, the depth of the  
15 notches should be approximately 1.0 mm.

In a specific embodiment, the notches can be accomplished after the pages are brought together to form a book block, for example by a circular sawing means. In this embodiment, the sides of the sawing blade can rough the sides of the notches to enhance the adhesion of the glue. Other techniques for notching the pages would be apparent to a person in the art with the benefit  
20 of this disclosure.

In an alternative embodiment, the book pages can be printed on pre-perforated paper sheets which can be ripped into book pages, wherein the perforated edges can enhance the adhesion of the glue. Accordingly, notching is then optional.

25 In a preferred embodiment of the subject invention, a cold water based glue can be utilized. Although other glues can also be used, for example hot glues. Advantageously, cold glue fumes are not harmful to humans and, therefore, the use of cold glue is not as expensive to implement as the use of hot glue is. Advantageously, a book bound with cold glue in accordance with the subject invention can have a flexible spine, allowing the book to be opened flat.

30 Referring to Figures 7A and 7B, once cut, the smaller sheets of paper can be deposited onto the paper-tray station 11 that holds the smaller loose sheets of paper one on top of other until the printer finishes printing all of pages of the book.

Referring to Figures 8A and 8B, when the printing means finishes printing all the sheets of paper and stops, a sensor can send a signal for the paper-tray station 11 to open and release the plurality of sheets into, for example, a movable clamping means 12 such that all of the pages



become a single book block. These pages can be numbered and collated in such a way that a specific edge of the paper 33 is sufficiently exposed to attach the cover. This space is preferably about 1/4". This exposed edge is the spine of the book, where the cover label will be glued.

Referring to Figures 9A and 9B, in a preferred embodiment, the design of the jaws 34 in the clamping means 12 can force open, in a semi-fan shape, the exposed paper. Accordingly, the paper will receive more of the glue, creating a firmer bind with the cover.

Referring to Figure 10, upon receiving all of the book pages a sensor can send a signal to a stacking means 13, for example underneath the floor of the clamping means 12, and cause the stacking means 13 to vibrate. Simultaneously, a horizontal bar 35 can push the sheets of paper and align them into uniform edges to make a rectangular book block. At the same time, the movable clamping means 12 can close its jaws 34 and subsequently tighten the sheets of paper into a single book block unit. In a preferred embodiment, the jaws 34 can close a little bit while the vibrating is stopped and then the sheets can be vibrated some more, and then the jaws 34 can close a bit more, until a book block is formed. This stopping and closing of jaws 34 continues for approximately a few seconds such that all edges of the book block are even.

Referring to Figures 11A and 11B, when the jaws of the clamping means 12 are closed and holding the book block firmly and tightly, the clamping means 12 can begin to move the book block down the line 36. The movable clamping means 12 can transport the book through the glueing means 14 that applies the glue.

Referring to Figures 12A and 12B, the glue is preferably, a water based glue with a liquid viscosity that allows it to penetrate deep into the notches of the paper, improving its adhesive force. Preferably, the subject invention can provide for a fast drying time by, for example, taking out the water with hot air. Preferably, the glue possesses long lasting elastic properties and, therefore, does not become brittle or crisp. Water based glue is safe to use under any circumstance since it does not release harmful fumes, in contrast to the hot glue of thermal binders. Cold glue may be stored indefinitely in a sealed container 37, and may be applied either with a pump 38, a dispersing gun, or other applying means. The movable clamping means 12 can then transport the book block through a glue cleaning means 15 that can clean the excess glue and, for example, spreads it evenly along the spine.

In a preferred embodiment, once the excess glue is cleaned, the book block then continues to the glue drying station. Referring to Figure 13, when the book block reaches the drying means 18 that dries the glue by, for example, use of hot air, the movable clamping means 12 can stop until a timer and/or sensor signals that the glue is dry.



Referring to Figure 14, the book block is then moved through the labeling means 17 which can apply a strip label of heavy stock paper to cover the spine of the book. This strip label can have printed on it the international standard book number (ISBN), title, author's name, and/or any other pertinent information. Preferably, the quality and color of the paper can be equal to the quality and color of the heavy stock covers of the book already printed, such that the label is indistinguishable from the covers themselves. The self adhesive spine cover label can be provided, for example, by a roller, and deposited into a feeder by a series of rollers that keep it in place and apply the label with precision 39. Since the thickness of each book will vary, the width of the spine cover label can exceed, for example, by at least one inch, the total thickness of an average book 400 pages long. Once the book block reaches the proper place in the line, the cover label can be attached to the book block. In a specific embodiment, one piece of cover stock can have the cover printed on it and can be folded onto and applied to a book block consisting of the book pages, wherein a strip label is optional.

In an embodiment where one piece of cover stock is applied to a book block, the attachment of the cover to the spine of the book can be accomplished without application of a spine cover strip label. This embodiment can be implemented using cover stock of various sizes, according to the book size. In a specific example, a cover can be applied to a book measuring 8" by 5.5". The cover can be made out of, for example, a heavy stock of paper, leather or leather-like material, plastic or any other materials for the purpose of protecting the pages of the book. The cover can then be cut to a size of 8" x 14", either before being printed by the printer or after. Also, either before or after the cover is cut, a strip of self adhesive glue, measuring, for example, 2"x 8", can be applied transversely to the back of the cover. This glue strip can have a peel-off sheet to expose the glue. This strip is preferably at least 2" by 8", and is preferably applied at a distance of at least 5" from the edge of the back of the front part of the cover. Preferably, the self adhesive glue matches the type of glue with which the book block was glued.

This cover can have printed on it the international standard book number (ISBN), title of the book, author's name, and/or any other pertinent information. The self-adhesive cover can be provided, for example, by a roller, and deposited into a feeder by a series of rollers that keep it in place and attach the cover with precision 39. Since the thickness of each book will vary, the width of the adhesive on the cover can preferably exceed, for example, by at least one inch on each side, the total thickness of an average book 400 pages long. Once the book block reaches the proper place in the line, the cover can be attached to the book block.

Referring to Figures 15A - 15C, with respect to an embodiment where a one piece cover is to be applied, the book block continues through the folding means 40 where the cover can be



folded up on both sides of the spine by a folding means 18. This folding means 18 also gives the final 'square' edge to the spine of the book. As it leaves the folding means 18, the excess of cover stock and paper can be cut by a trimming means 19.

5 Referring to Figures 15A - 15C, with respect to an embodiment where a spine cover strip label is applied, the book block continues through the folding means 40 where the spine cover strip label can be folded up by about 1/4" up in both sides of the spine by a folding means 18. This folding means 18 also gives the final 'square' edge to the spine of the book. As it leaves the folding means 18, the excess of spine cover strip label can be cut by a trimming means 19.

10 Referring to Figure 16, the movable clamping means 12 moves the book into the final forming means 41. After the movable clamping means 12 moves the book into the end station, it opens its jaws and releases the book into a final forming means, which in a particular embodiment is made of horizontal 42 and vertical 43 rollers. The book passes in between these rollers. A motor can move the set of moving rollers with their speed controlled by, for example, electronic sensors. The rollers move the book in such a way so as to force it to follow a path.  
15 Then the finished book exits the machine through the delivery means.

Referring to Figure 17, the finished book then exits the machine.

20 It should be understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to persons skilled in the art and are to be included within the spirit and purview of this application and the scope of the appended claims.



Claims

1           1. A device for printing and binding a book, comprising:  
2       a receiving means for receiving data corresponding to the content of a book;  
3       a formatting means for formatting the text of the book into a book distribution;  
4       a printing means for printing the content of the book on paper sheets upon receipt of a signal  
5           from said receiving means;  
6       a clamping means for clamping the printed pages into a book block; and  
7       a glueing means for applying glue to the spine of the book block.

1           2. The device, according to claim 1, further comprising:  
2       a notching means for notching the spine edge of the book pages, wherein said notching means  
3       creates notches which enhance the adhesion of the glue on the spine of the book block.

1           3. The device, according to claim 2, further comprising:  
2       a cutting means for cutting said paper sheets into smaller sheets,  
3           wherein said printing means prints multiple pages of text on each paper sheet and said  
4       cutting means cuts said paper sheet into smaller sheets such that each smaller sheet can have a  
5       book page printed on each side.

1           4. The device, according to claim 1, wherein said glueing means applies a cold glue.

1           5. The device, according to claim 4, wherein said cold glue is water based.

1           6. The device, according to claim 1, further comprising:  
2       a labeling means for attaching a spine cover label to the spine of the book, wherein said printing  
3       means prints a cover image on cover stock to create cover pages, wherein said cover pages are  
4       included in the book block clamped together by the clamping means and glued together by the  
5       glueing means, and wherein said spine cover label is attached to the spine of the book so as to  
6       overlap onto the cover pages.

1           7. The device, according to claim 1, further comprising:  
2       a covering means for attaching a cover to the book block, wherein said printing means prints a  
3       cover image on cover stock to create a cover for the book, and wherein said covering means



4 attaches said cover to the glued book block such as to cover the spine and pages of the book  
5 block.

1 8. The device, according to claim 1, further comprising:  
2 a stacking means for stacking and aligning the book pages into a book block which is clamped  
3 in the clamping means.

1 9. The device, according to claim 1, wherein said receiving means can receive data  
2 corresponding to the text of a book from a remote location wherein said receiving means deletes  
3 said data after printing the book so as to avoid unauthorized copies of the book from being  
4 printed.

1 10. The device, according to claim 1, wherein said received data includes control data  
2 which indicates the format, font type, or type size of the text, wherein said receiving means  
3 controls the format, font type, or type size of the text corresponding to the received control data.

1 11. The device, according to claim 1, further comprising a user interaction means  
2 whereby a customer can select a book to be printed and bound.

1 12. The device, according to claim 3, wherein two pages of text are printed on each side  
2 of each paper sheet such that when the paper sheet is cut in half, smaller sheets are formed,  
3 wherein each smaller sheet can have text on both sides.

1 13. The device, according to claim 3, wherein said notching means and said cutting  
2 means are the same such that the book pages are notched as the paper sheets are cut into book  
3 pages.

1 14. The device, according to claim 1, wherein the received data corresponding to the  
2 text of the book can be in electronic text format.

1 15. A system for distributing and manufacturing books, comprising:  
2 an input means for inputting requests for books,  
3 a plurality of printing and binding means for printing and binding books upon receipt of book  
4 text data and control data, and



5 at least one central distribution unit which receives requests for selected book texts and causes  
6 said book text and control data to be transferred to said printing and binding means, wherein said  
7 control distribution unit and said plurality of printing and binding means are geographically  
8 separated.

1 16. The system, according to claim 15, wherein said central distribution unit comprises  
2 a storage means wherein said central distribution unit accesses the requested book texts from  
3 said storage means.

1 17. The system, according to claim 15, wherein said central distribution unit accesses  
2 the requested book texts from a plurality of storage facilities.

1 18. The system, according to claim 17, wherein said plurality of storage facilities  
2 correspond to a plurality of publishers and authors.

1 19. The system, according to claim 15, wherein the book text data transferred from the  
2 central distribution unit to the printing and data binding means includes formatting data.

1 20. The system, according to claim 15, wherein each said printing and binding means  
2 comprises a computer means for receiving the book text data, temporarily storing the book text  
3 data, and formatting the book text data for printing and binding in accordance with said requests.

1 21. A method for producing and distributing books, comprising the following steps:  
2 creating a plurality electronic text files which corresponds to the content of a corresponding  
3 plurality of books, storing said plurality of text files, allowing a customer to order one or more  
4 of said plurality of books, transmitting the electronic text files corresponding to the ordered  
5 book(s) to a device capable of printing and binding said ordered book(s),  
6 wherein said device is conveniently located for the customer and said ordered books are printed  
7 and bound such as to allow the customer to pick-up the ordered book(s) in at said device within  
8 a short period of time.

1 22. A method for printing and binding a book, comprising the following steps:  
2 receiving data corresponding to the content of a book;  
3 formatting the text of the book into a book distribution;



4 printing the content of the book on paper sheets upon receipt of a signal;  
5 clamping the printed pages into a book block; and  
6 applying glue to the spine of the book block.

1 23. The method, according to claim 22, further comprising the step of:  
2 notching the spine edge of the book pages, wherein said notches enhance the adhesion of the  
3 glue on the spine of the book block.

1 24. The method, according to claim 23 further comprising the step of :  
2 cutting said paper sheets into smaller sheets;  
3 wherein multiple pages of text are printed on each paper sheet and said paper sheets are  
4 cut into smaller sheets such that each smaller sheet can have a book page printed on each side.

1 25. The method, according to claim 22, wherein cold glue is applied.

1 26. The method, according to claim 25, wherein said cold glue is water based.

1 27. The method, according to claim 22, further comprising the step of:  
2 attaching a spine cover label to the spine of the book, wherein a cover image is printed on cover  
3 stock to create cover pages, wherein said cover pages are included in the book block clamped  
4 together and glued together, and wherein said spine cover label is attached to the spine of the  
5 book so as to overlap onto the cover pages.

1 28. The method, according to claim 22, further comprising the step of:  
2 attaching a cover to the book block, wherein said cover image is printed on cover stock to create  
3 a cover for the book, and wherein said cover is attached to the glued book block such as to cover  
4 the spine and pages of the book block.

1 29. The method, according to claim 22, further comprising the step of:  
2 stacking and aligning the book pages into a book block which is then clamped.

1 30. The method, according to claim 22, wherein said received data corresponding to the  
2 content of a book is received from a remote location, wherein said data is deleted after printing  
3 the book so as to avoid unauthorized copies of the book from being printed.



1           31. The method, according to claim 22, wherein said received data includes control data  
2           which indicates the format, font type, or type size of the text, wherein said format, font type, or  
3           type size of the text is controlled according to the received control data.

1           32. The method, according to claim 22, further comprising the step of allowing user  
2           interaction, whereby a user can select a book to be printed and bound.

1           33. The method, according to claim 24, wherein two pages of text are printed on each  
2           side of each paper sheet such that when the paper sheet is cut in half, smaller sheets are formed,  
3           wherein each smaller sheet can have text on both sides.

1           34. The method, according to claim 24, wherein said notching step and said cutting step  
2           are performed simultaneously such that the book pages are notched as the paper sheets are cut  
3           into book pages.

1           35. A device for binding a book, comprising:  
2           a paper sheet receiving means for receiving a plurality of paper sheets which are to be bound  
3           together,  
4           a clamping means for clamping the received plurality of paper sheets into a book block,  
5           a glueing means for applying glue to the spine of the book block.

1           36. The device, according to claim 35, further comprising:  
2           a notching means for notching the spine edge of the book pages, wherein said notching means  
3           creates notches which enhance the adhesion of the glue on the spine of the book block.

1           37. The device, according to claim 35, further comprising:  
2           a cutting means for cutting said paper sheets into smaller sheets; and  
3           wherein said printing means prints multiple pages of text on each paper sheet and said  
4           cutting means cuts said paper sheet into smaller sheets such that each smaller sheet can have a  
5           book page printed on each side.

1           38. The device, according to claim 35, wherein said glueing means applies a cold glue.



1           39. The device, according to claim 38, wherein said cold glue is water based.

1           40. The device, according to claim 35, further comprising:  
2           a labeling means for attaching a spine cover label to the spine of the book, wherein said printing  
3           means prints a cover image on cover stock to create cover pages, wherein said cover pages are  
4           included in the book block clamped together by the clamping means and glued together by the  
5           glueing means, and wherein said spine cover label is attached to the spine of the book so as to  
6           overlap onto the cover pages.

1           41. The device, according to claim 35, further comprising:  
2           a covering means for attaching a cover to the book block, wherein said printing means prints a  
3           cover image on cover stock to create a cover for the book, and wherein said covering means  
4           attaches said cover to the glued book block such as to cover the spine and pages of the book  
5           block.

1           42. The device, according to claim 35, further comprising:  
2           a stacking means for stacking and aligning the book pages into a book block which is clamped  
3           in the clamping means, wherein the stacking and aligning of the book pages.

1           43. The device, according to claim 37, wherein two pages of text are printed on each  
2           side of each paper sheet such that when the paper sheet is cut in half, smaller sheets are formed,  
3           wherein each smaller sheet can have text on both sides.

1           44. The device, according to claim 37, wherein said notching means and said cutting  
2           means are the same such that the book pages are notched as the paper sheets are cut into book  
3           pages.



1/18

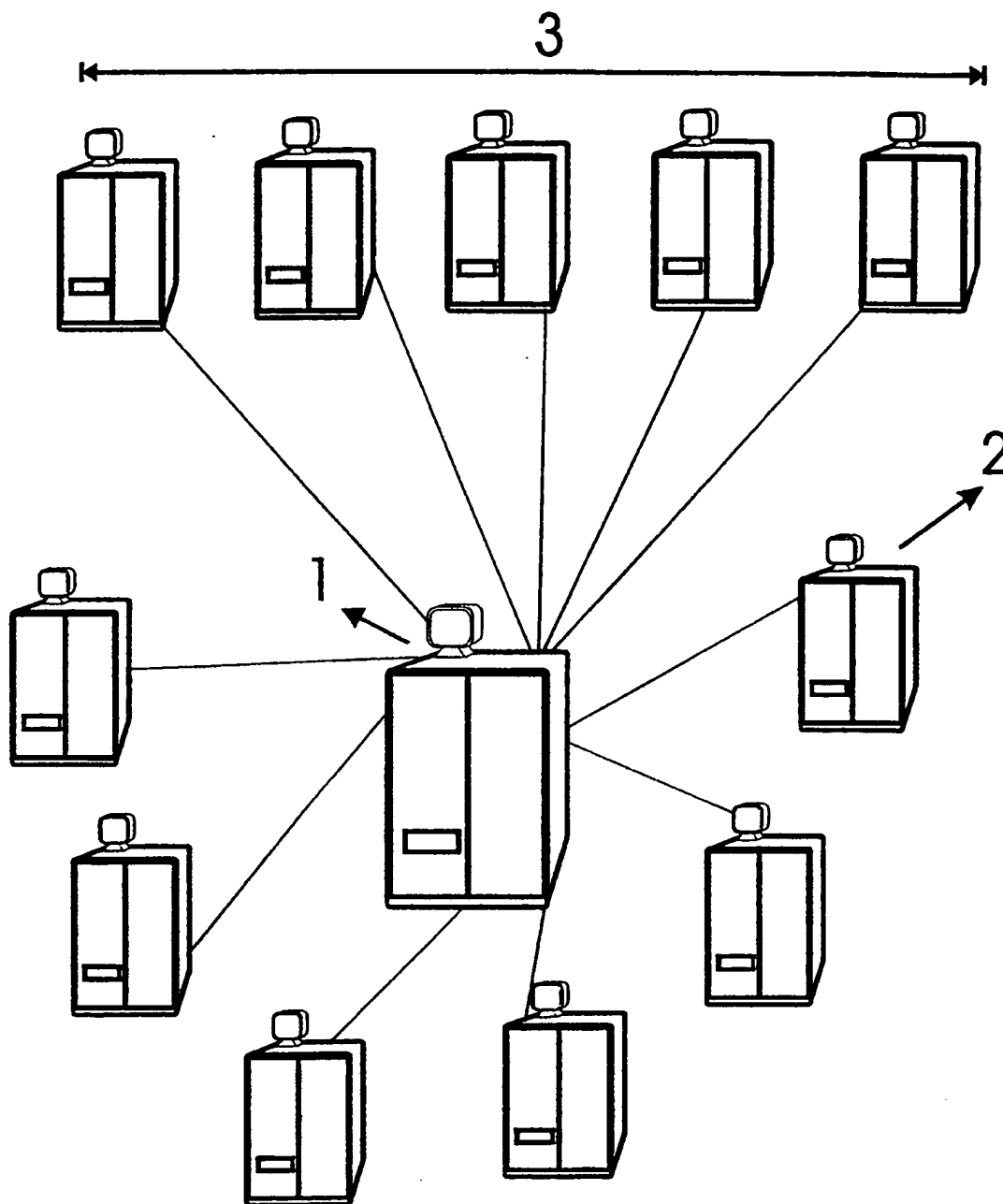
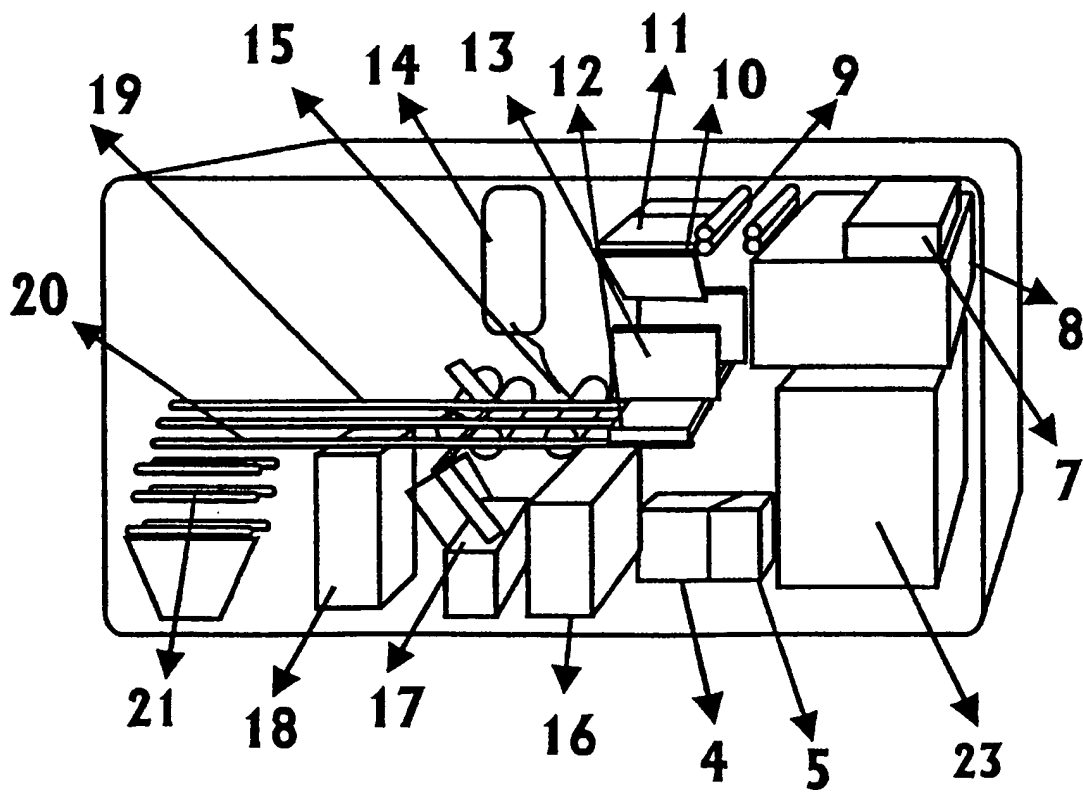
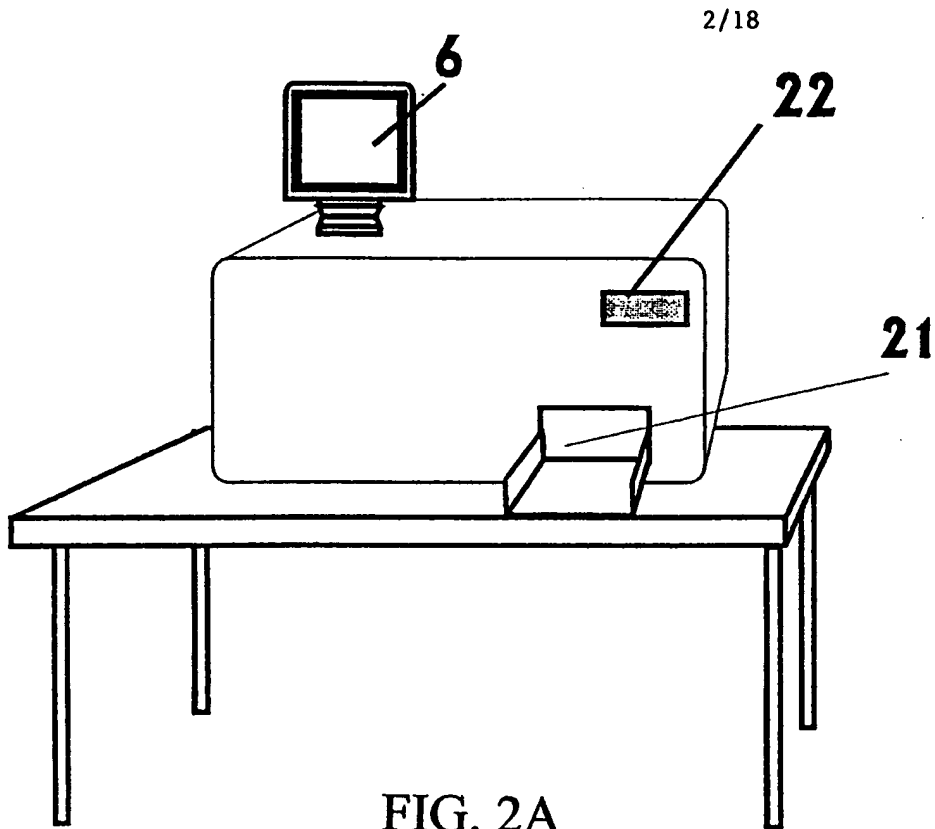


FIG. 1







3/13

3

6

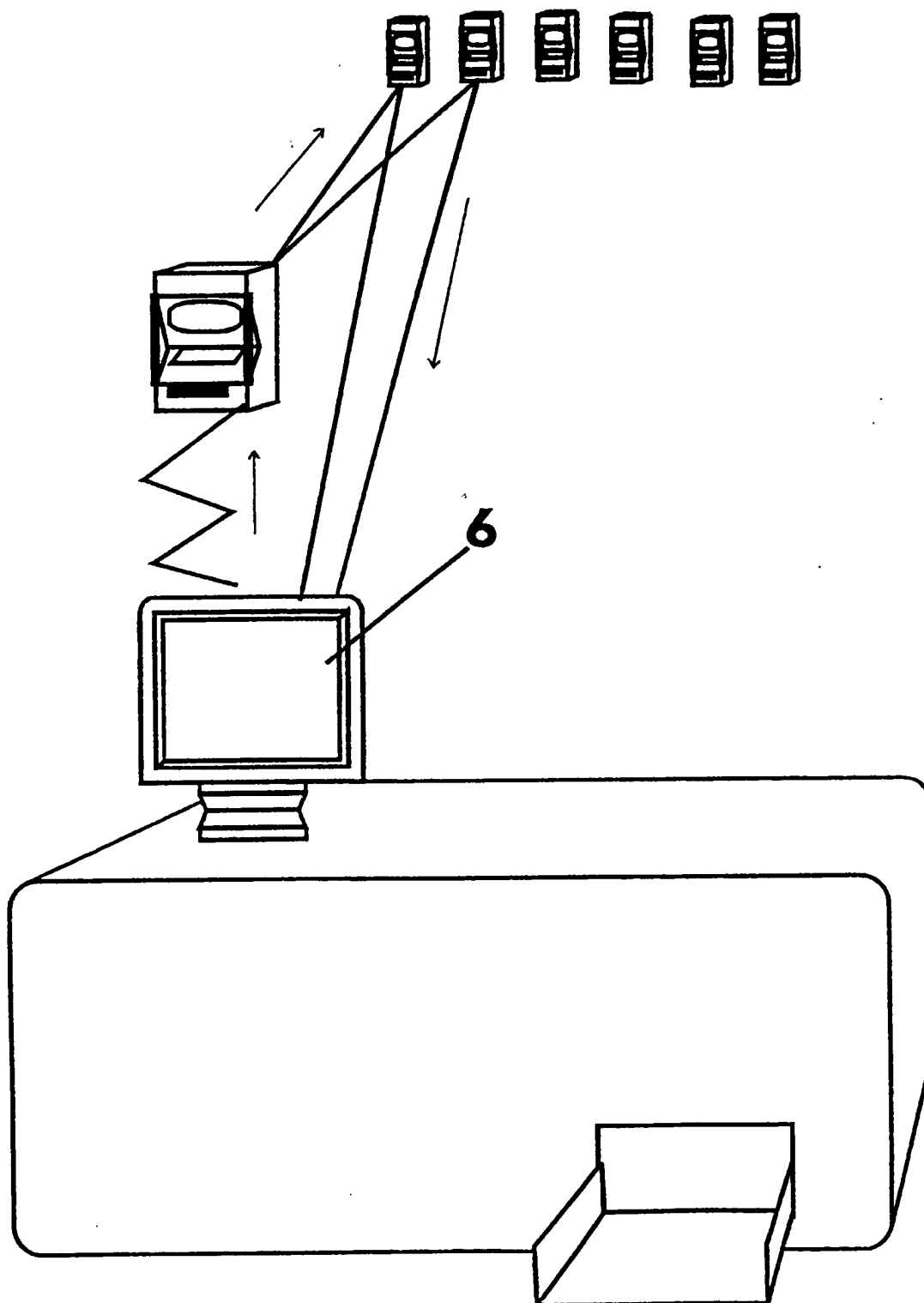


FIG. 3



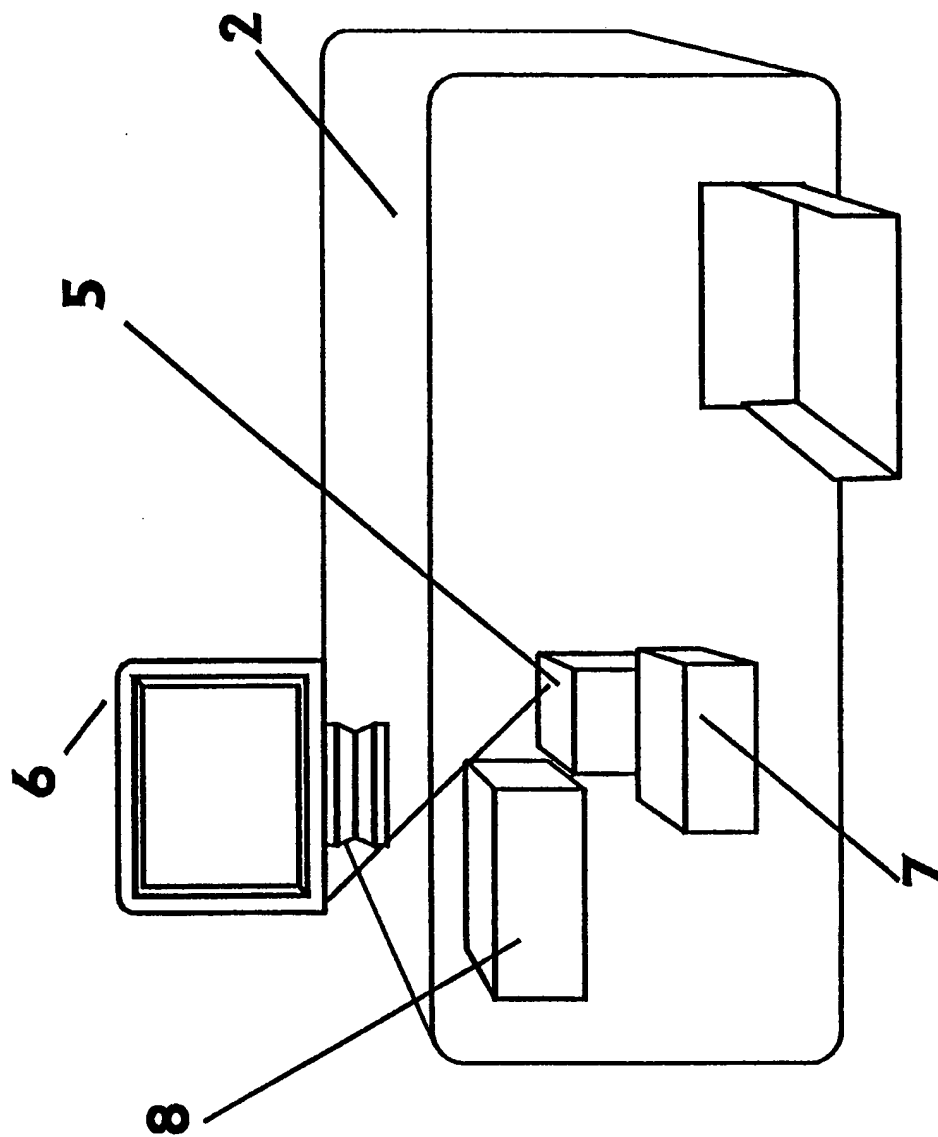


FIG. 4



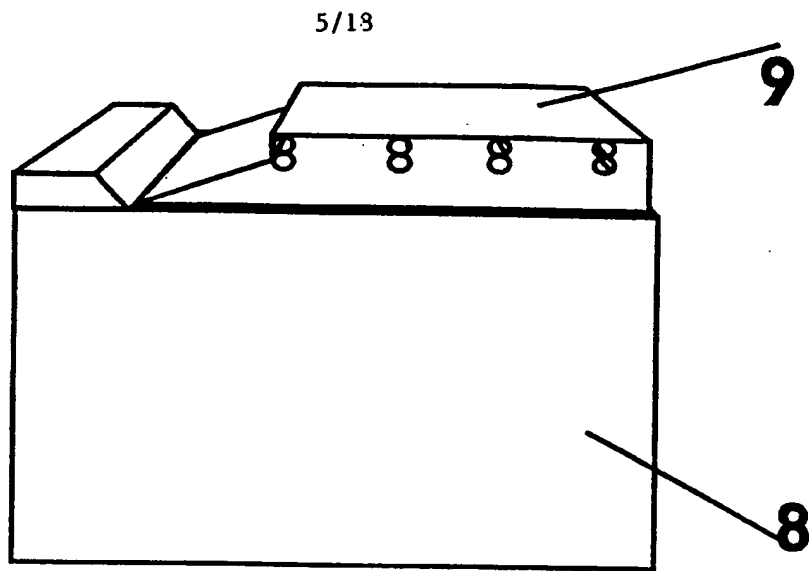


FIG. 5A

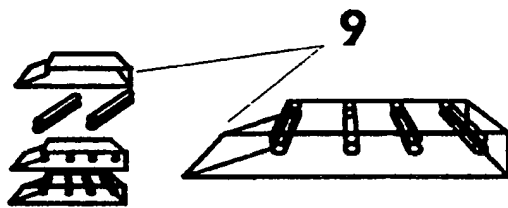


FIG. 5B

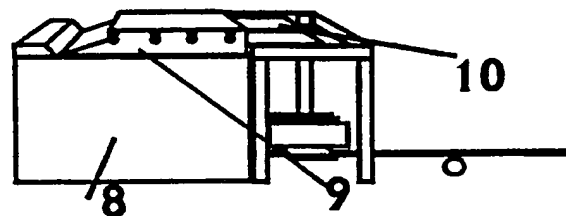


FIG. 5C

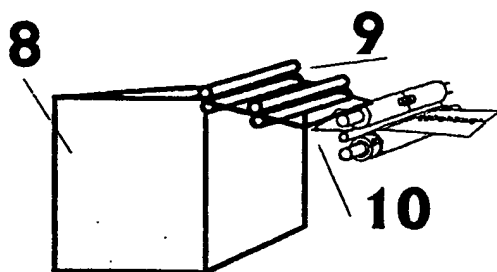


FIG. 5D

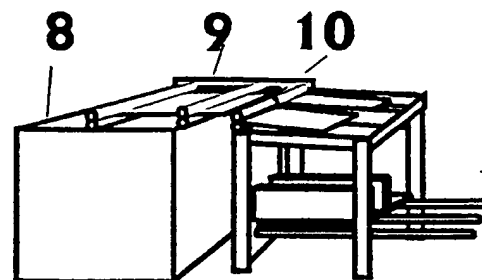


FIG. 5E



6/18

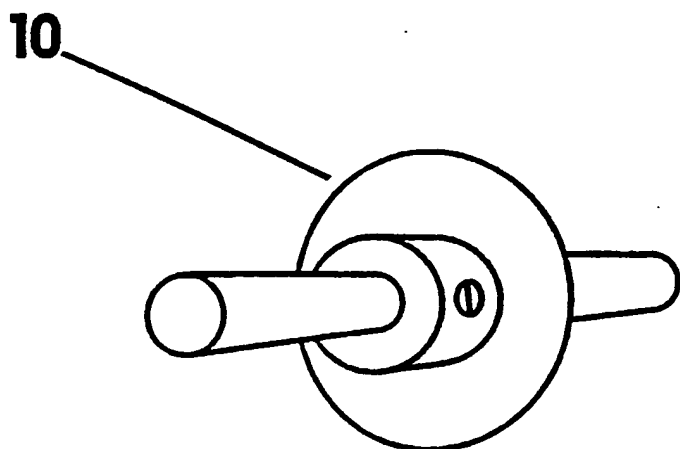


FIG. 6A

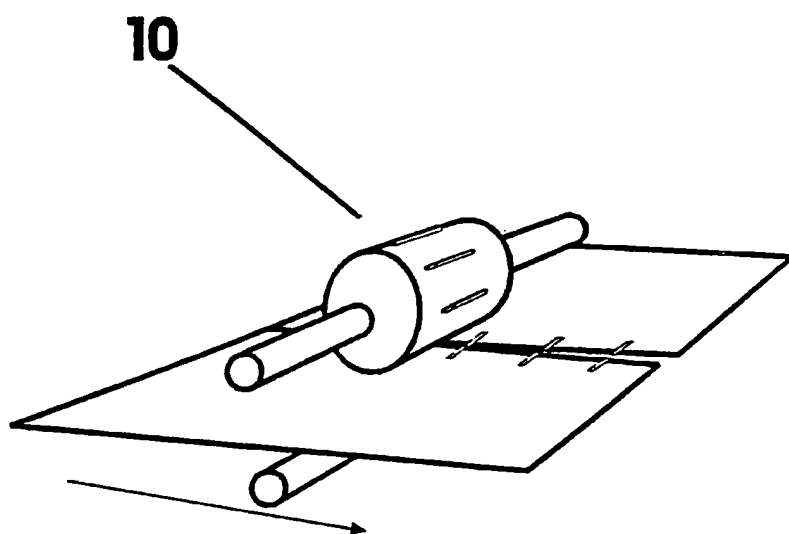


FIG. 6C

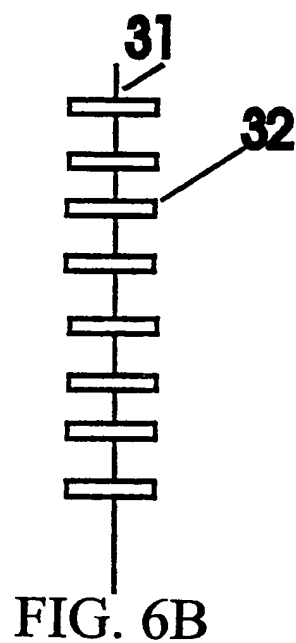


FIG. 6B



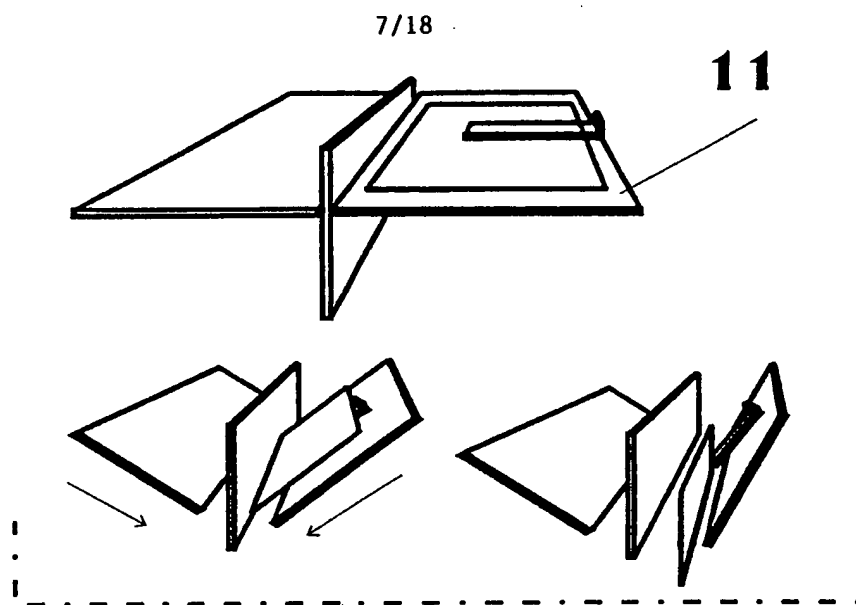


FIG. 7A

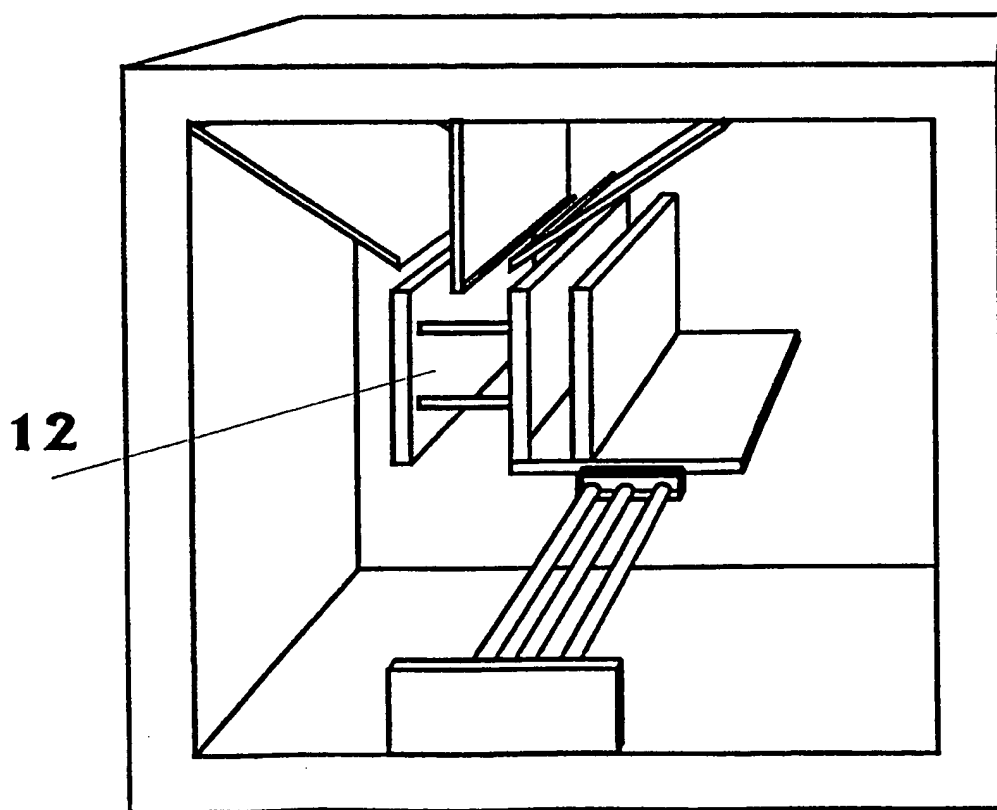


FIG. 7B



8/18

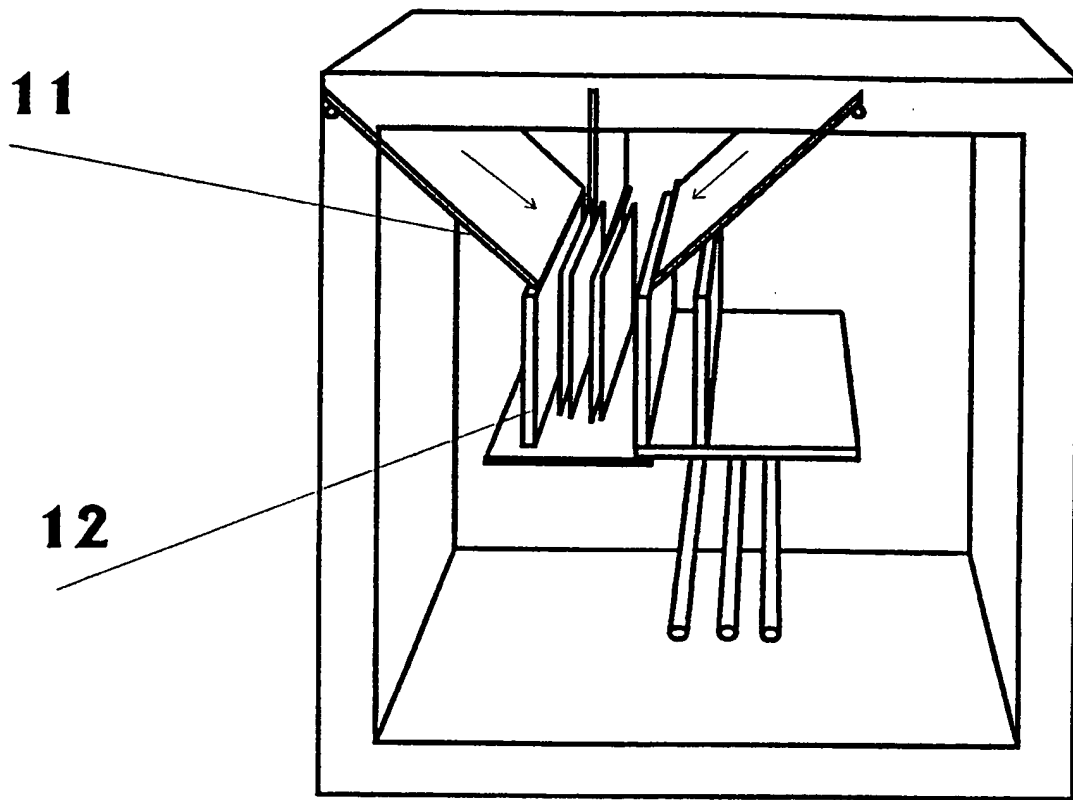


FIG. 8A

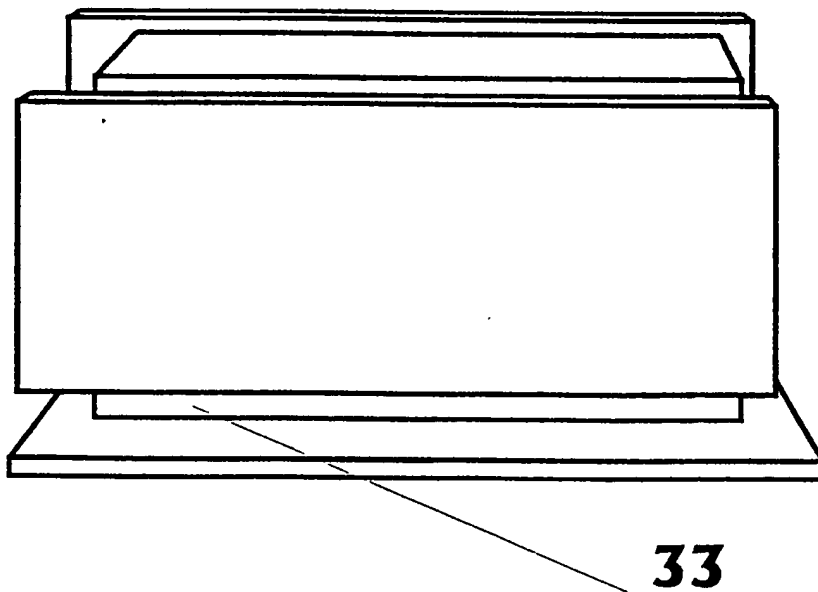


FIG. 8B



9/18

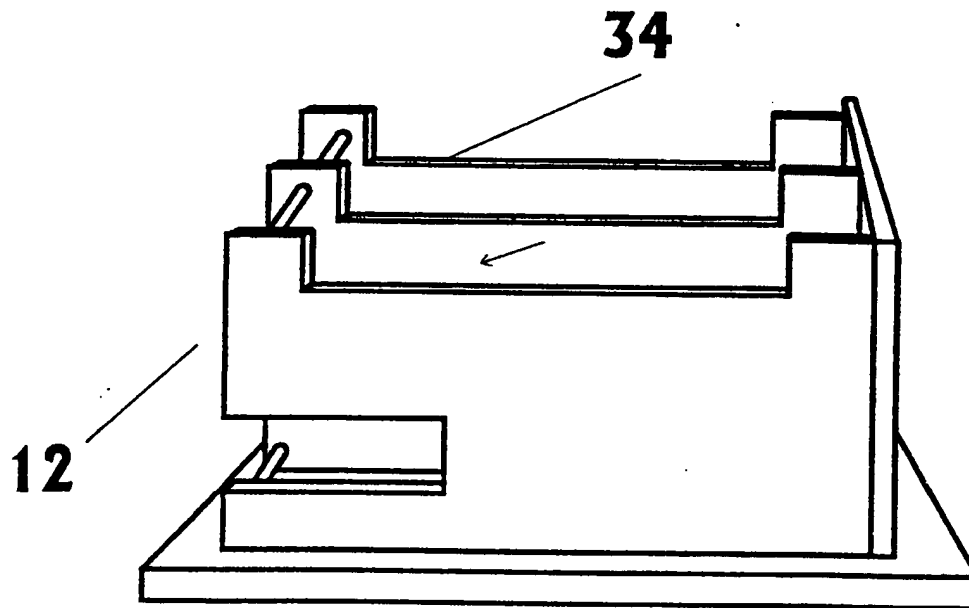


FIG. 9A

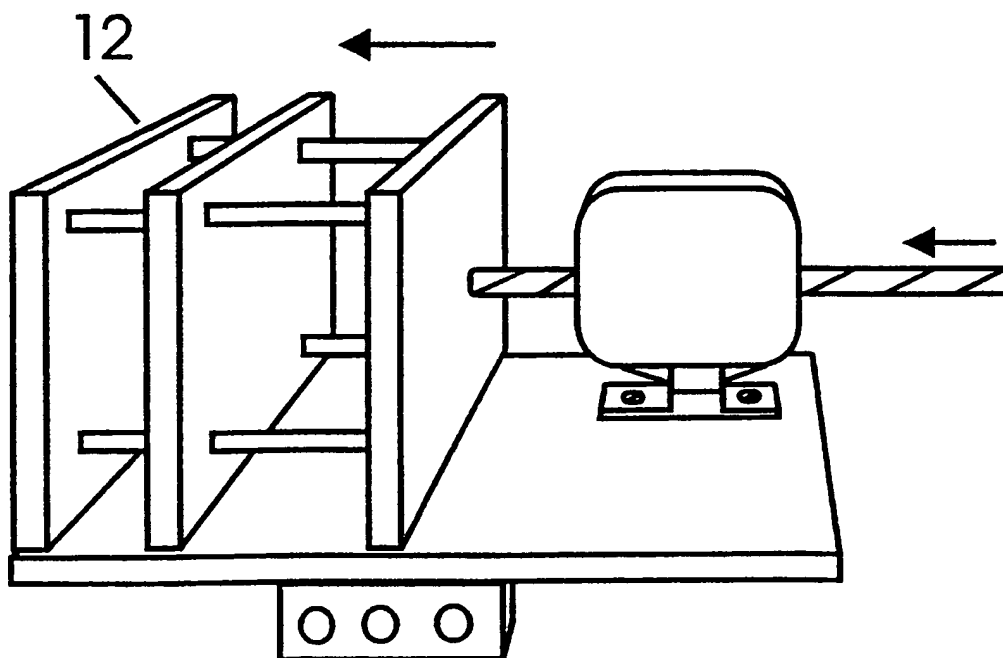


FIG. 9B



10/18

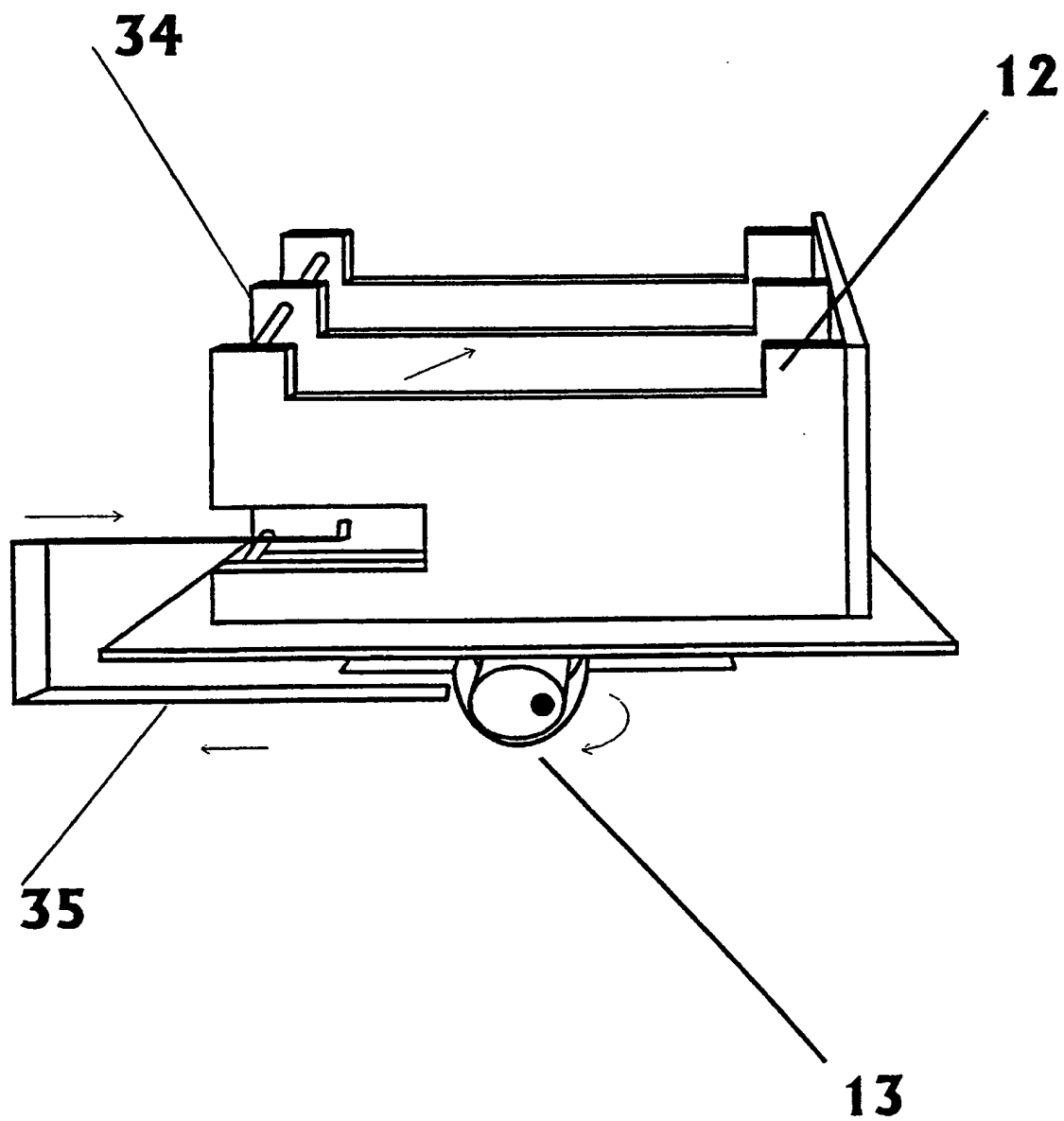


FIG. 10



11/18

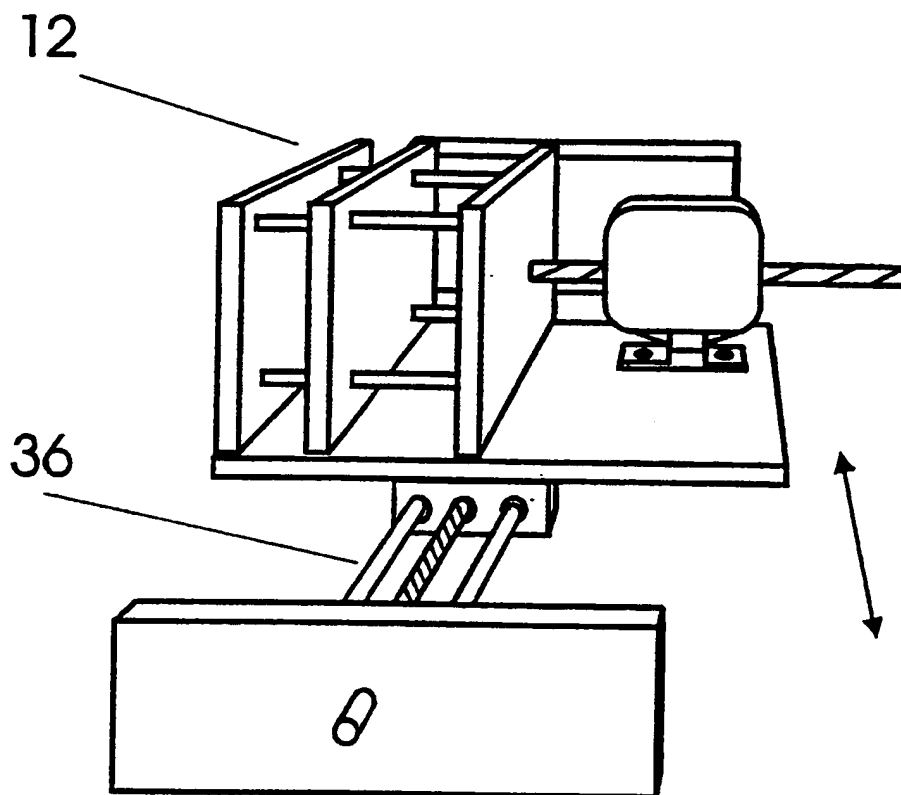


FIG. 11A

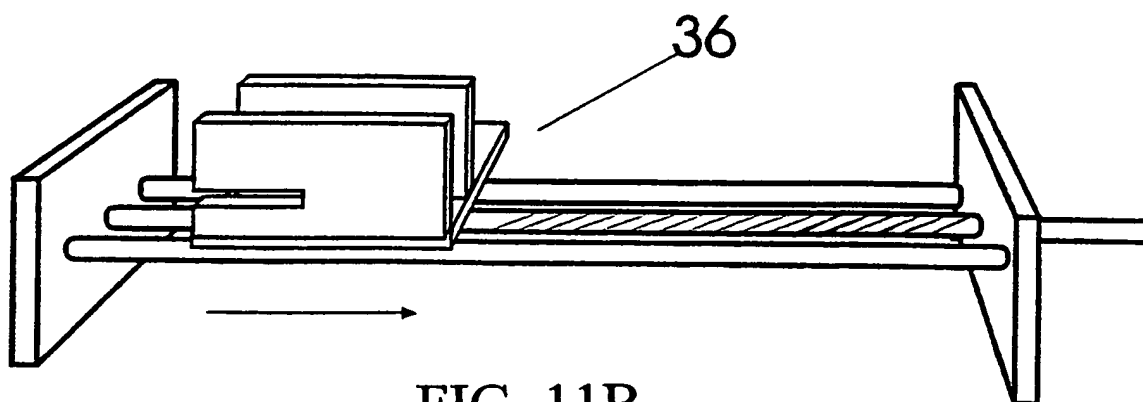
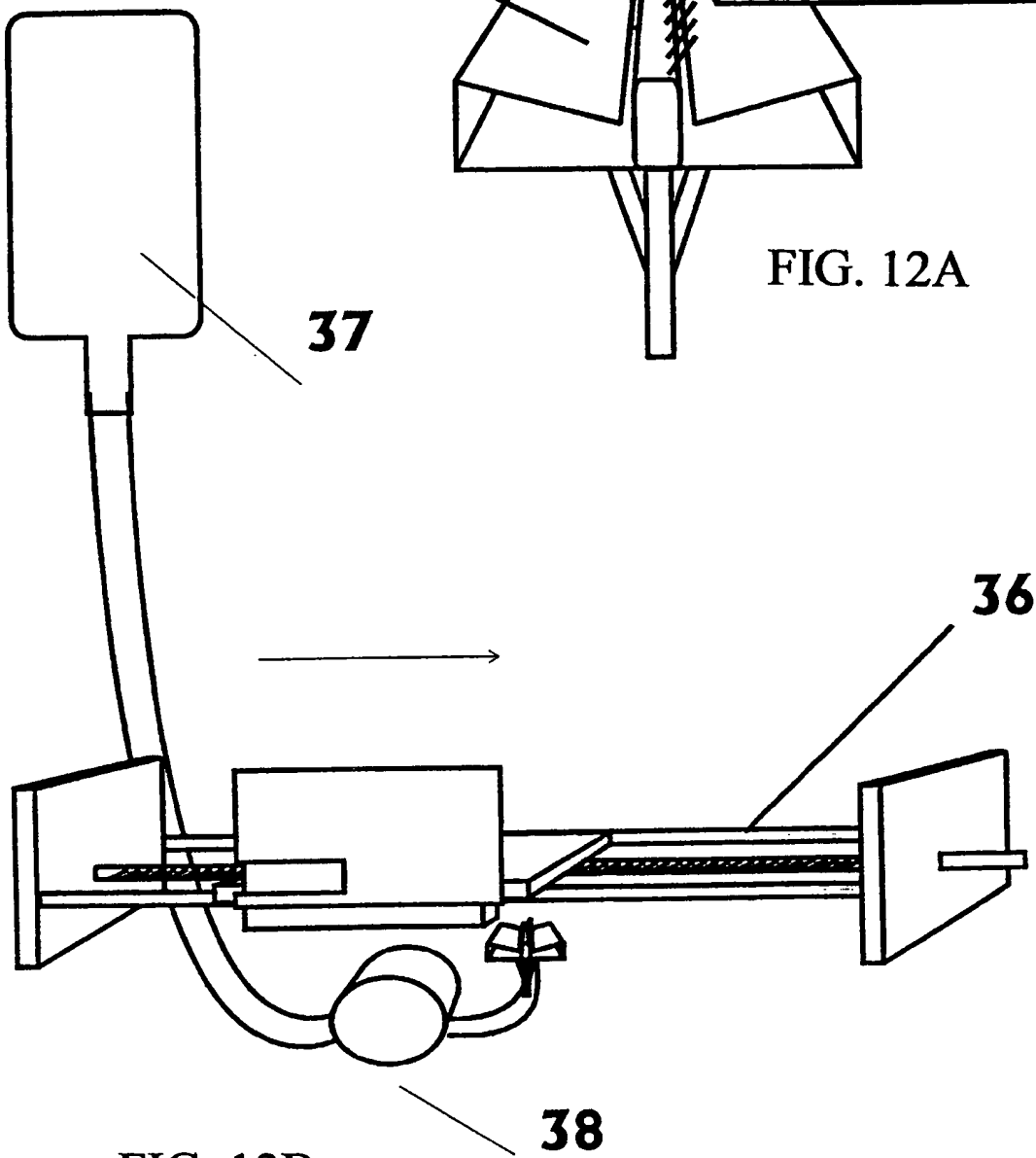
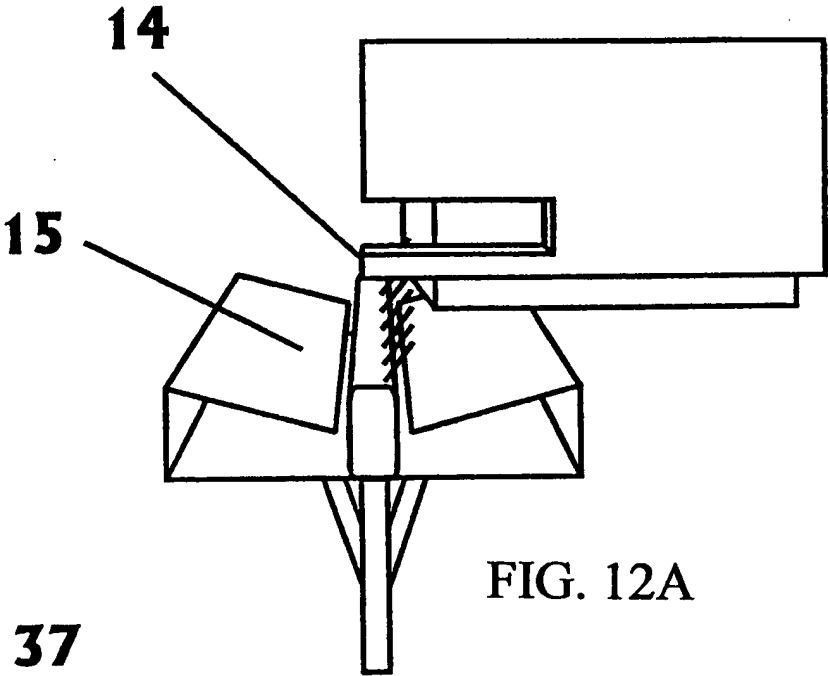


FIG. 11B



12/18





13/18

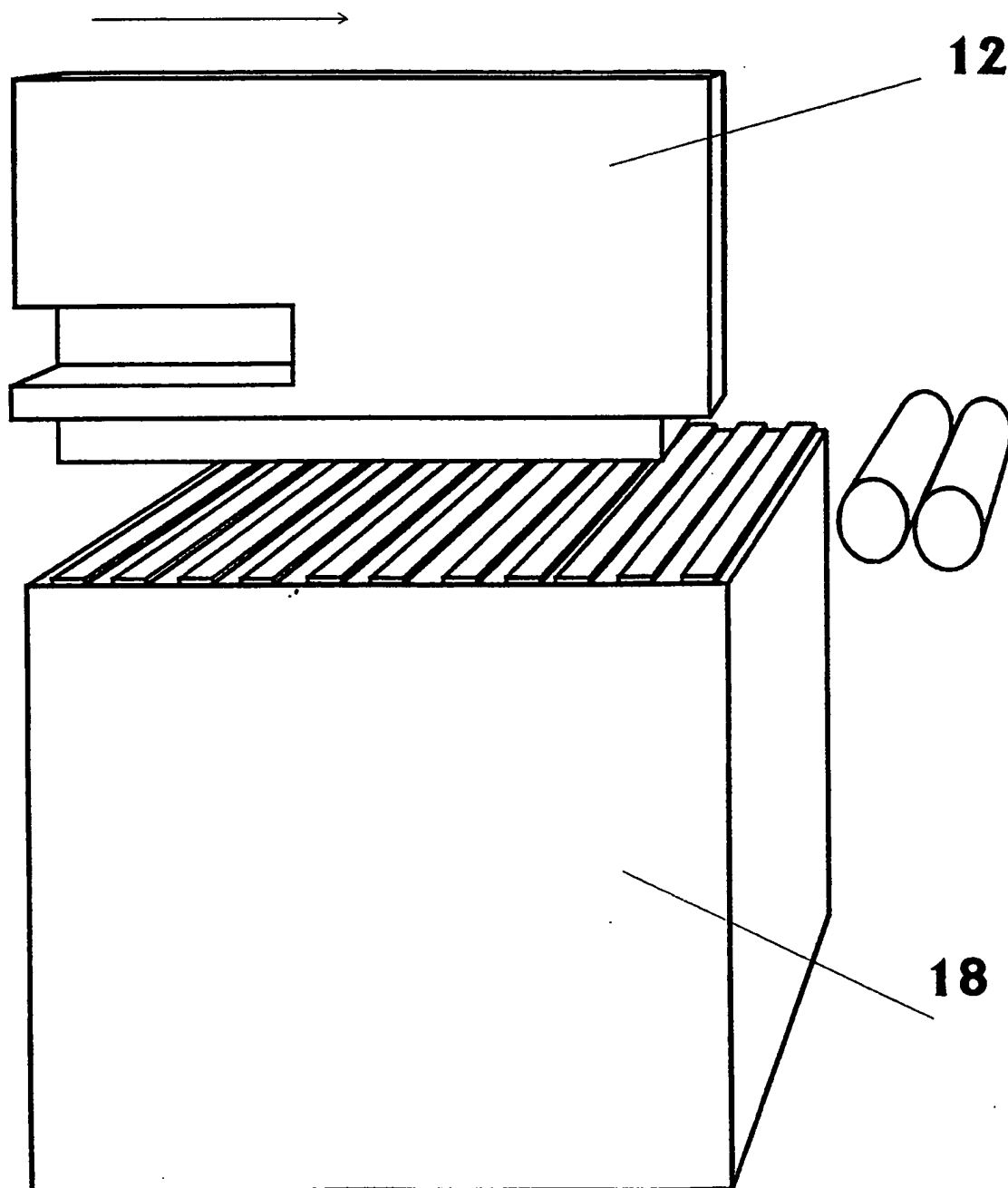


FIG. 13



14/18

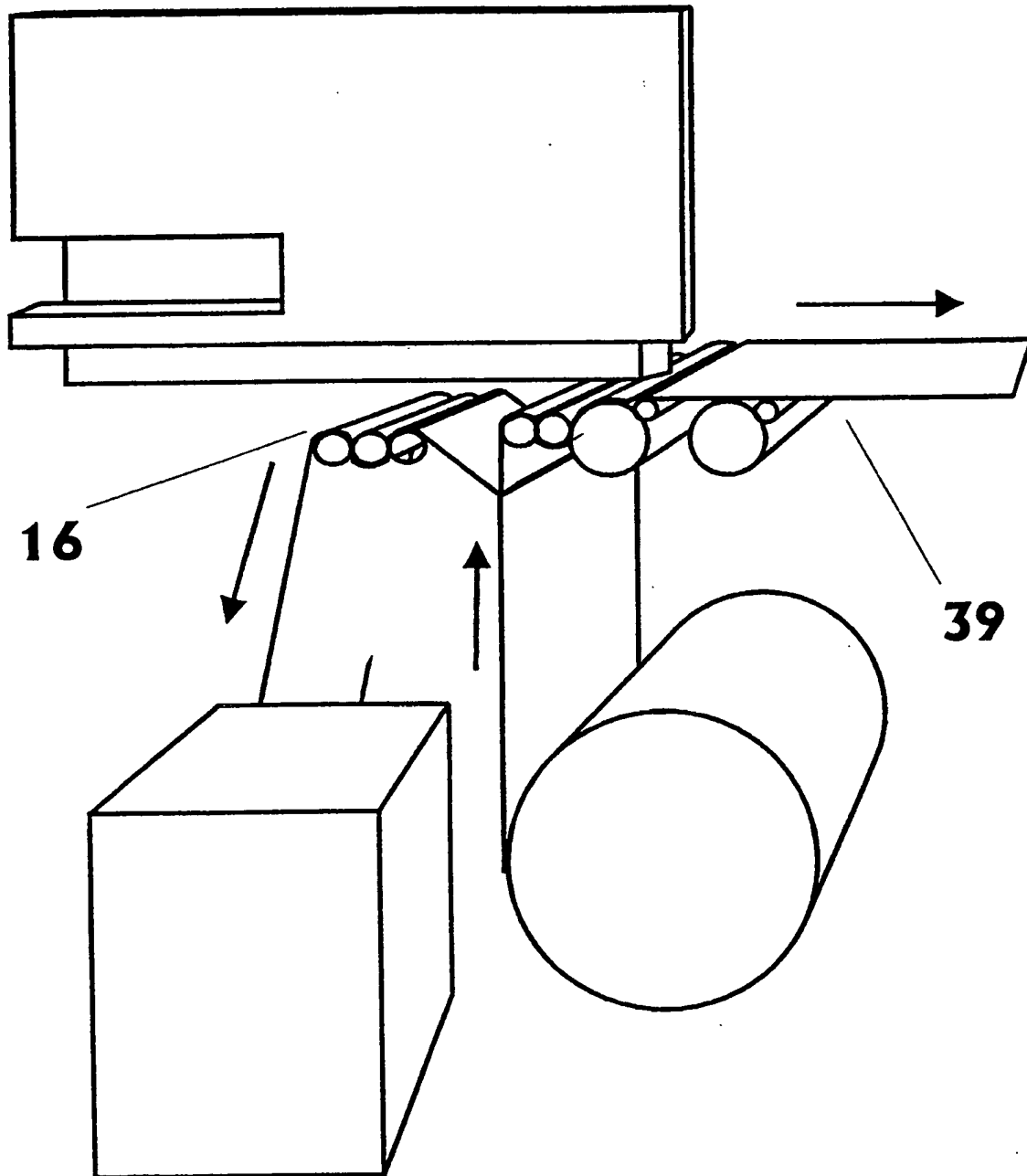


FIG. 14



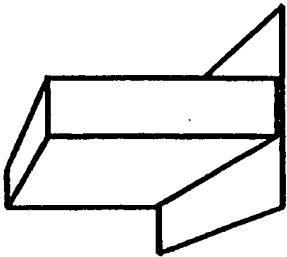
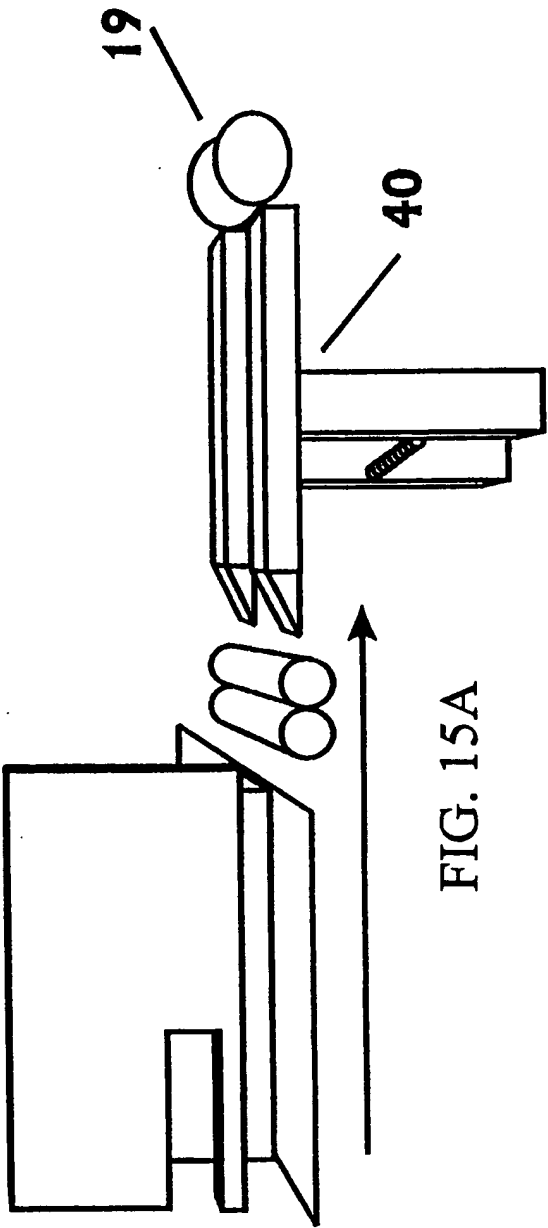


FIG. 15B

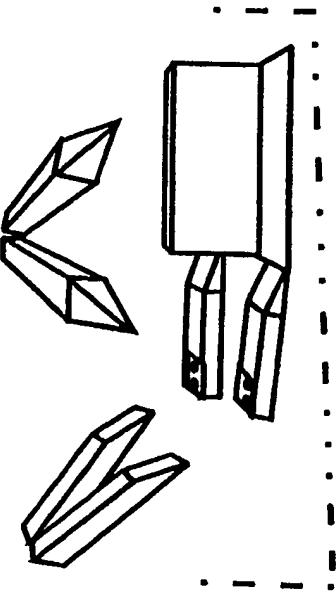
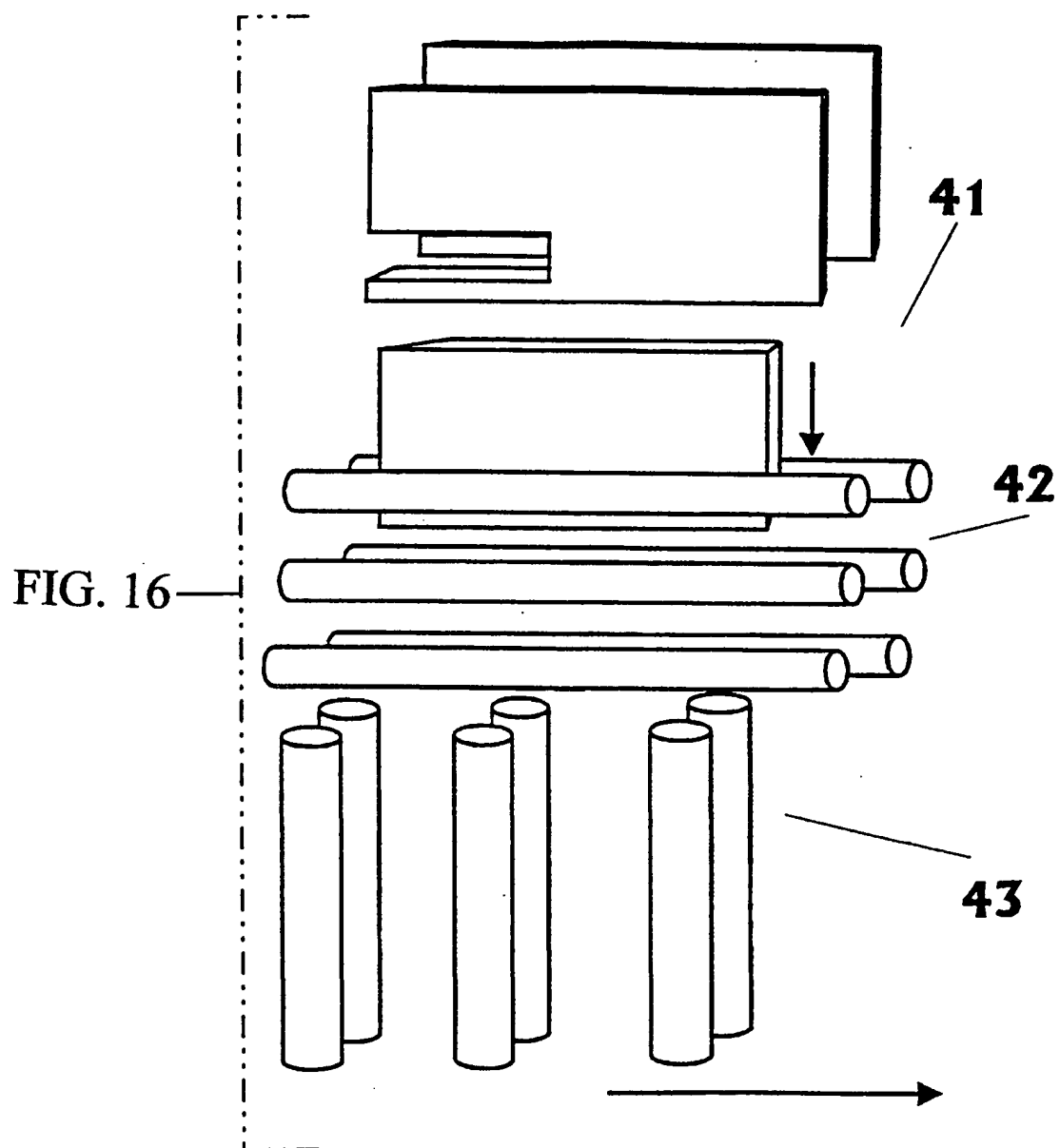


FIG. 15C



16/18





17/18

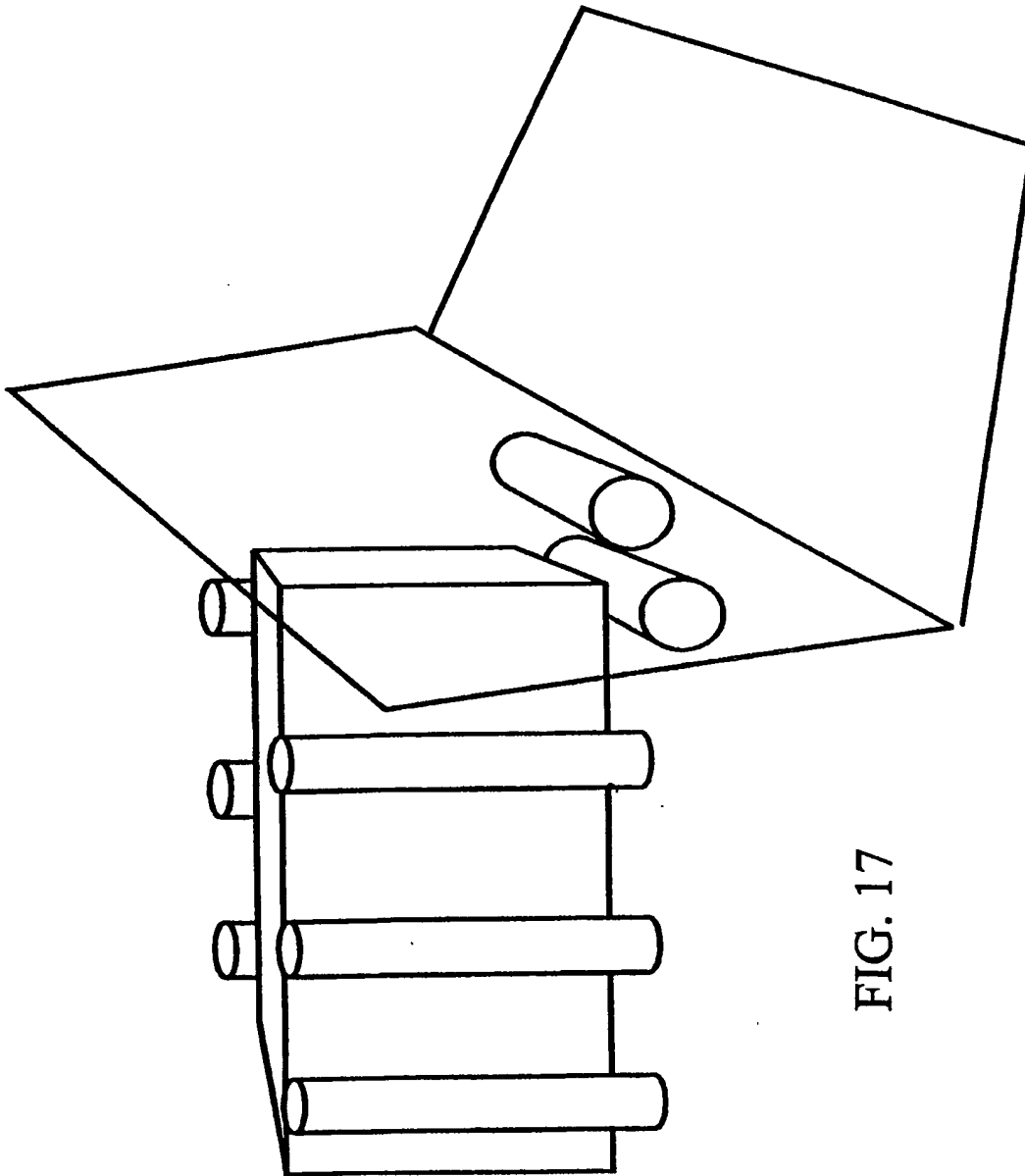


FIG. 17



18/18

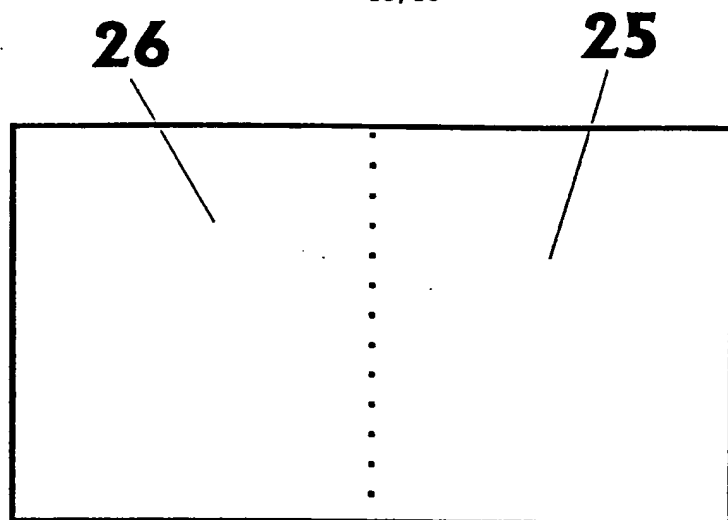


FIG. 18

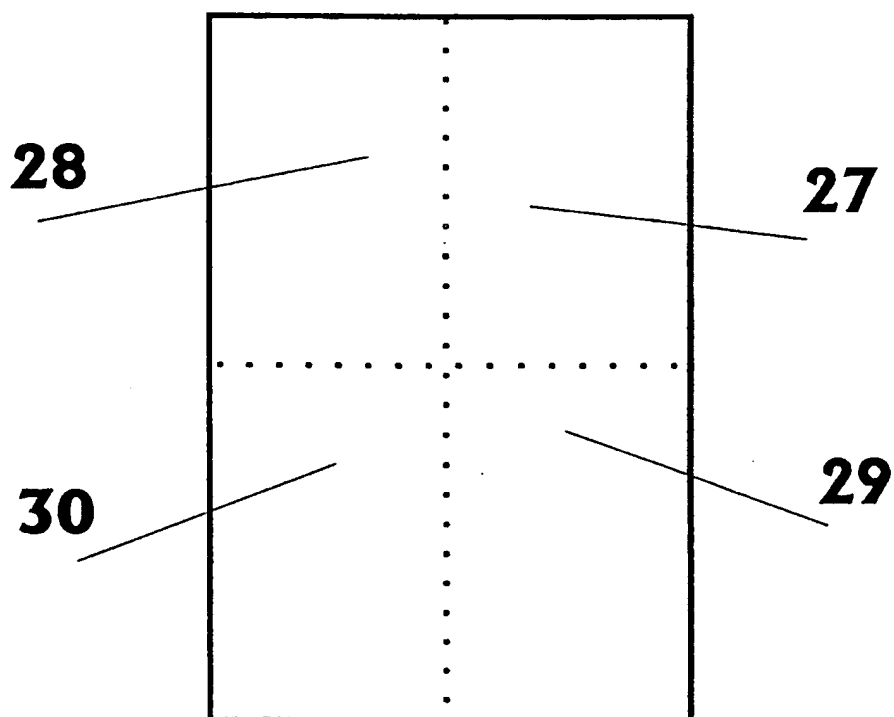


FIG. 19



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/20421

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B41F17/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B41F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 982 744 A (KRAYNAK, BLUMENFIELD) 28 September 1976 see figure 1	1-44
Y	US 5 465 213 A (ROSS) 7 November 1995 cited in the application see the whole document	1-44
A	US 5 213 461 A (KALISHER) 25 May 1993 see the whole document	1



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

### \* Special categories of cited documents :

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Date of the actual completion of the international search

14 January 1999

Date of mailing of the international search report

29/01/1999

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Evans, A



**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

PCT/US 98/20421

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